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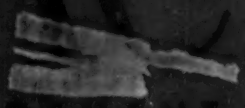
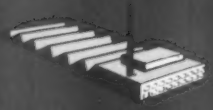
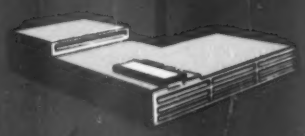
FACTORY

JANUARY 1953

MANAGEMENT AND MAINTENANCE







Survey of maintenance practices and responsibilities in 542 plants helps answer...

What Should Maintenance Cost?

PAGE 113

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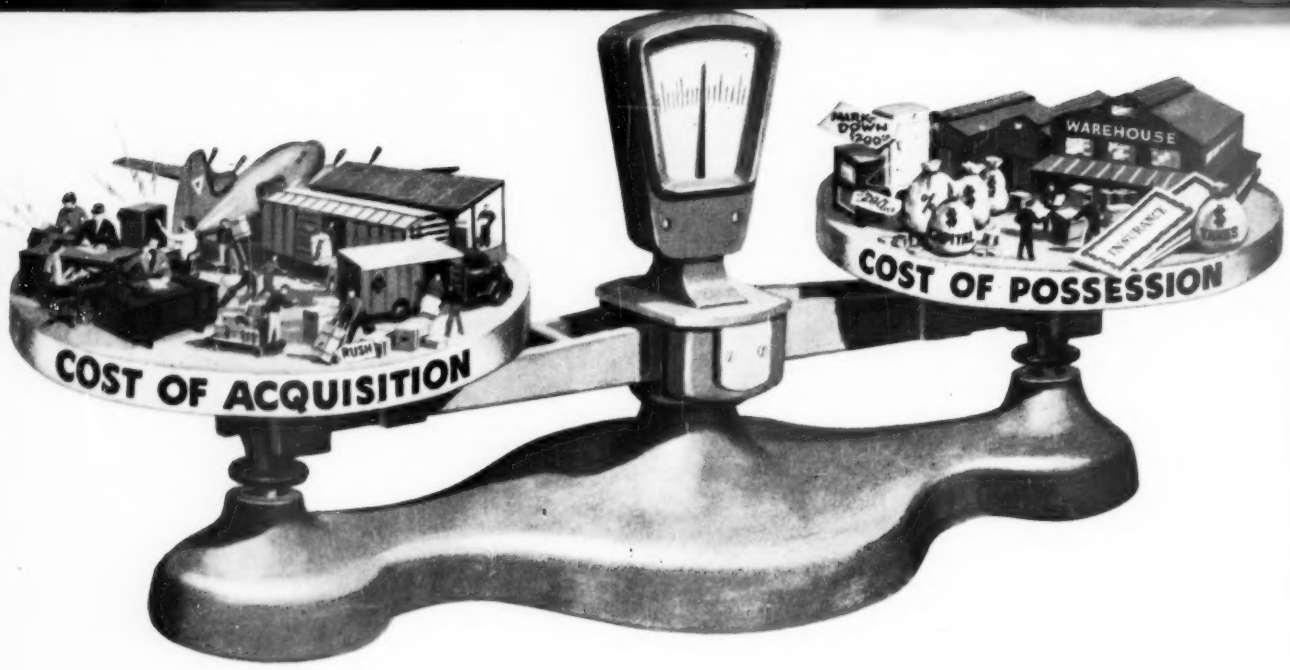

KARDEX INVENTORY CONTROL BALANCES COST OF GETTING WITH COST OF KEEPING

Under today's conditions of uncertain supply, failure to keep your inventory carefully balanced can mean the difference between profit and loss. More and more companies everywhere are turning these losses into profits with Kardex Simplified Inventory Control. With it, turnover is improved on each inventory item, up to the point of diminishing returns, by keeping "Cost of Acquisition" in balance with "Cost of Possession."

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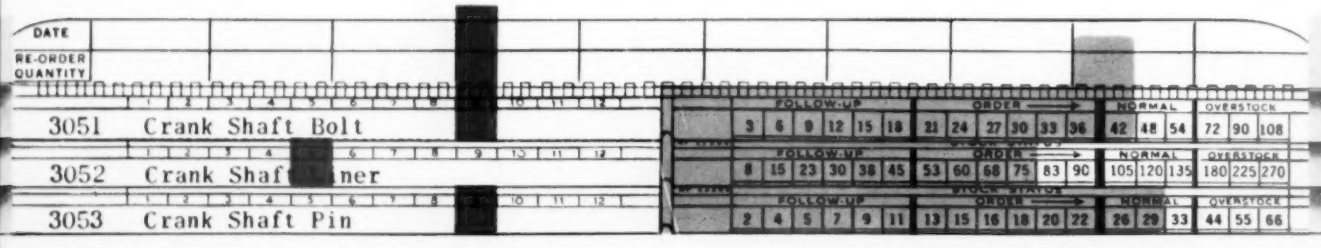
VALUABLE 24-PAGE BOOK — FREE! "HOW TO GET PROFITS FROM INVENTORIES." It's packed with helpful facts that will show you how easily you can put your inventory under complete and effective control.

Just phone, or visit the nearest Remington Rand Business Equipment Center, or write Room 1628, Management Controls Library, 315 Fourth Ave., New York 10.

Remington Rand INC

Now Kardlok — New Kardex Feature . . . illustrated here with three overlapping record pockets selected from a typical Kardex record. Blisters formed in the signal mate with die-cuts in the record card, permit quicker, easier setting of signals . . . caliper-accurate positioning of signals . . . and positive locking of signal settings.



RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

Photo courtesy United Engineering & Foundry Co., New Castle, Pa.

Sizzling sand poured on rubber

A typical example of B.F.Goodrich improvement in rubber

STEAMING hot sand, from molds used to make steel castings, is dumped on this belt every few minutes.

Ordinary belts stood the sizzling sand for only 30 days. A belt made of woven asbestos lived a short, simmering life of 60 days. But even during this brief life, the belt had to have "first aid" every week — a dressing to protect it from the heat.

The company was far from satisfied. They asked about rubber, but every salesman said it couldn't stand the terrific heat. Every salesman, that is, but one.

A B.F.Goodrich man told them that his company had developed a special heat-resisting rubber for belts carrying such things as hot sand, lime, nitrates. Instead of ordinary fabric, they used *glass* fabric to make a belt that can stand heat as high as 500° F. Put to work here, the BFG belt outlasted all previous belts. It performed for two years — a ripe old age for a belt in a busy foundry that works 24 hours a day, 7 days a week.

New and improved products, like this hot material belt, are the result of the B.F.Goodrich emphasis on research — finding better and more economical ways of getting things done with industrial rubber products. That's why it pays to keep in touch with your BFG distributor for the latest ways to save with rubber. *The B.F.Goodrich Company, Industrial & General Products Division, Akron, Ohio.*

B.F.Goodrich
RUBBER FOR INDUSTRY

FACTORY
MANAGEMENT AND MAINTENANCE

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OF PLANT MANAGEMENT
FOR 62 YEARS

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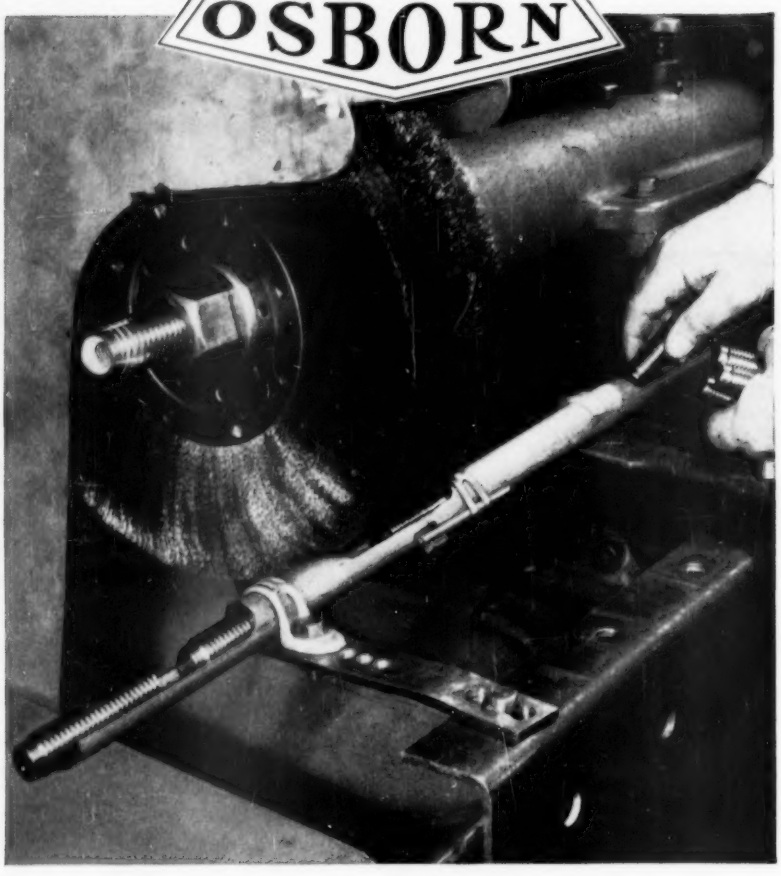


How to find an 800% production increase in a piece of pipe

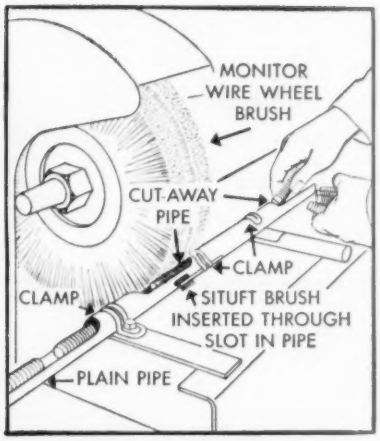
You can save manpower and money in countless ways when you tap the idea resources of power brushing. For example:

It took 18 seconds to clean the threads of the 2½ x ¾-inch set screws shown above. Time was cut to 2 seconds with Osborn Power Brushing by devising the simple pipe fixture shown. The operator feeds the screws in one end of the pipe and an Osborn brush makes contact with the work at a slot cut in the pipe, spinning and cleaning the threads uniformly. A little stationary wire brush, inserted as shown through the pipe, controls rotation and traverse of the work.

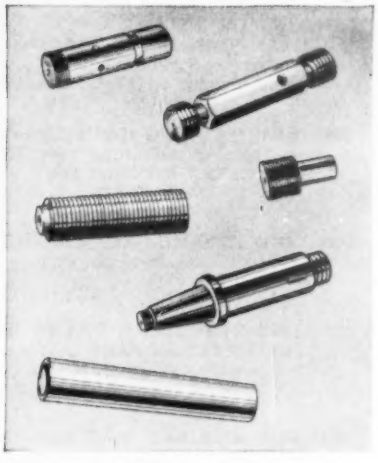
Have your **O**sborn **B**rushing **A**nalyst help you develop and apply output-increasing ideas to *your* cleaning and finishing operations. Call now or write *The Osborn Manufacturing Company, Dept. H-1, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

OSBORN

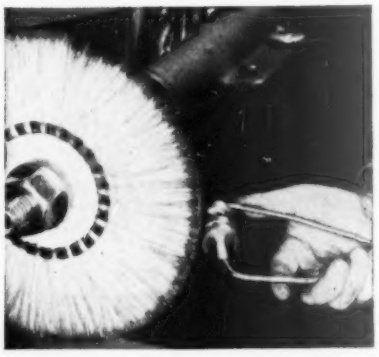
LOOK FOR THE NAME OSBORN . . . RECOGNIZED EVERYWHERE FOR QUALITY WORKMANSHIP AND MATERIALS



THE FIXTURE. This sketch shows how to make pipe fixture for deburring and polishing small parts, threaded or smooth. Can be made of steel, fiber or plastic tubing.



TYPICAL PARTS. Set screws, pins, pieces of tubing and other parts such as these can be cleaned and finished in the pipe fixture **or in** the forceps shown below.



ANOTHER SIMPLE APPROACH. For small parts such as bushings, a simple forcep fixture can be devised to hold parts for power brushing. This one is made of wire.

WHATEVER YOUR SIGNALING NEED — you can get the proper equipment from your local Graybar office. Edwards Lokator code-paging or calling systems . . . Altec electronic sound systems . . . Webster intercommunication systems . . . USI sound-powered telephones . . . *plus* fire alarm systems . . . bells, buzzers, horns, sirens, howlers — *all* are reliable products made by leading manufacturers. Check your nearby Graybar Representative for complete information on any item.

TALK, WARN, CALL, LOCATE — anywhere in your plant

FLICK-OF-A-SWITCH PAGING. An Edwards Lokator quickly locates personnel throughout your plant. Installations can be made using any type of signal equipment — horns, bells, buzzers, musical notes, or flashing lights.

Clear, fast plant-wide intercommunication speeds day-to-day operations . . . becomes absolutely vital during emergencies. But, before you buy communication equipment, check with Graybar to make sure you're getting the right choice of units for long-term service. Get the help of an experienced Graybar Signaling Specialist in planning the system best suited to your requirements — a system that will save steps, save time, save money . . . perhaps even lives.

Because Graybar distributes a complete line of signaling equipment, you or your electrical contractor can get all of your needs from a single convenient source. Your purchasing problem is simplified . . . you take full advantage of Graybar's nation-wide warehousing system . . . you can be sure of prompt, on-schedule deliveries.

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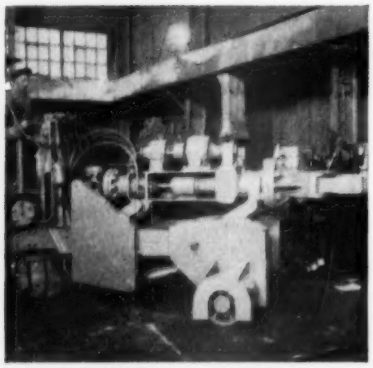
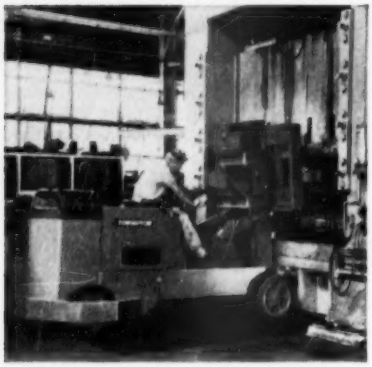
TW TIRE AND WHEEL ANALYSIS man shows you how to slash industrial tire costs



What type tire is best for this job?

Which tread compound wears longest?

How do you determine the right size tire?



What tread compound is best for extra-heavy loads?

Need tires to resist cuts and bruises?

Use solid, semi-pneumatic or pneumatic tires?

YOU can save as much as 50% on industrial tire costs by calling in a B. F. Goodrich Tire and Wheel Analysis man. He is trained to:

1. study your equipment, loads, speeds, hauling surfaces and any unusual materials handling problems you have,
2. make suggestions for better, more efficient maintenance that alone can save you 10 to 20%,
3. and recommend the right tires—type, size, tread compound and tread design—for your particular operations.

You can be sure the advice you get is unbiased, for B. F. Goodrich makes a *complete* line of industrial tires—solids, pneumatics and semi-pneumatics in a wide range of tread designs and compounds.

Hundreds of industrial tire users are cashing in on the TW Analysis Plan—are getting more economical, more efficient service from industrial tires and wheels. Take advantage of this plan by sending in the coupon or calling your B. F. Goodrich retailer. He sells and services a complete line of industrial tires. A special TW Analysis Plan is available for manufacturers of industrial hauling equipment.

The B. F. Goodrich Co.
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Please send me:
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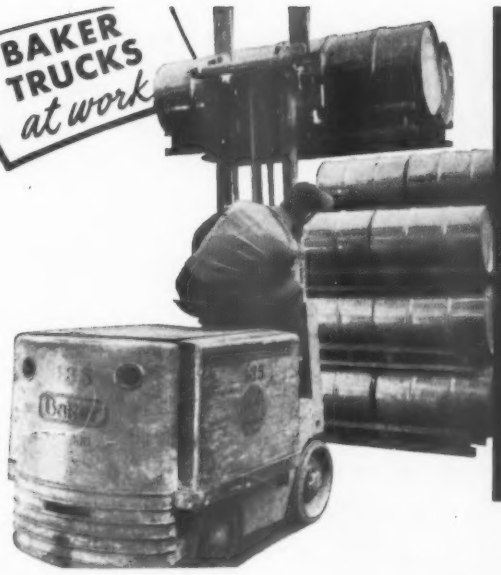
BAKER TRUCKS *at work*



Westinghouse saves in excess of $57,000 per year by FORK TRUCK HANDLING

Illustrated above is a special stringer pallet which enables Baker Fork Trucks to tier and transport drums four at a time, doubling storage capacity and speeding these operations substantially by eliminating manual methods.

This method of handling scrap saved $9,000.00 in one year. Driver merely operates controls—the truck does the work.

Handling castings in yard storage on pallets with Fork Trucks saves $7500.00 per year over former methods—and multiplies storage capacity by tiering.

By palletizing bagged materials for fork truck handling, tiering to warehouse ceiling more than doubles storage capacity. This method cuts handling costs $12,000.00 per year.

● A fleet of fork trucks including Bakers, coupled with intelligent planning and material handling engineering, enables Westinghouse Electric Corporation to cut handling costs more than $57,000.00 per year at its huge East Pittsburgh works. Savings in which the Baker Trucks participate, include:

- **$12,000.00 warehousing raw materials in the molded materials section**
- **Another $12,000.00 handling finished molded products**
- **$9,000.00 on one scrap handling operation**
- **$7,500 by handling castings on pallets in yard storage**
- **100% added storage capacity in molded materials warehouse**
- **Doubling capacity of drum storage space in yard**

These savings were made possible by replacing manual handling and other slow methods with efficient fork-truck unit-load handling. In some instances Westinghouse devised special pallets and containers to achieve greatest speed and efficiency from their versatile Fork Trucks.

The Complete Story is documented in Baker Case Study Report No. 272. Use this coupon to get your free copy.

THE BAKER-RAULANG COMPANY
1218 West 80th Street, Cleveland 2, Ohio

☐ Please send Westinghouse Case Study Report No. 272.
☐ I am also interested in ..... pound capacity trucks.

Name ..... *Title* .....

Company .....

Address .....

City ..... *State* .....

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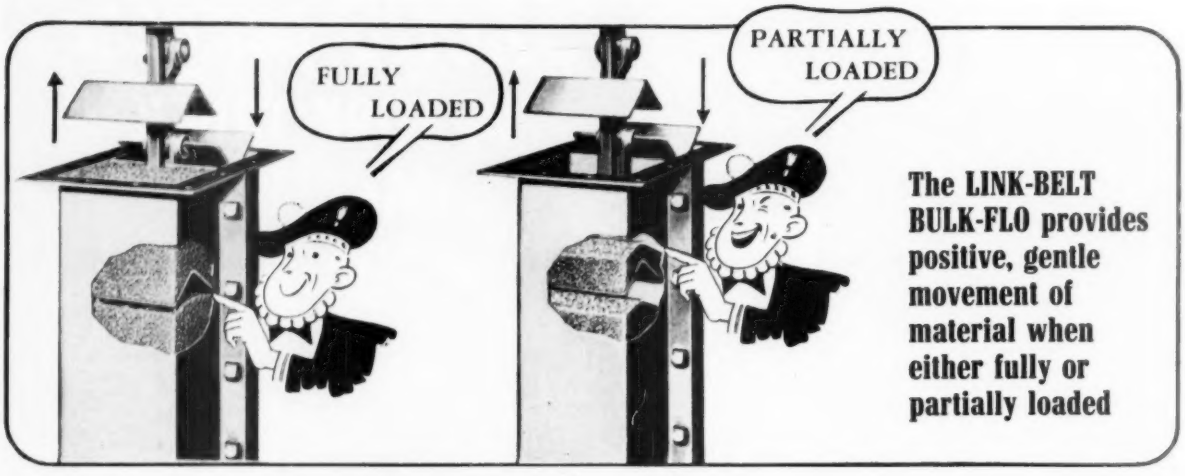


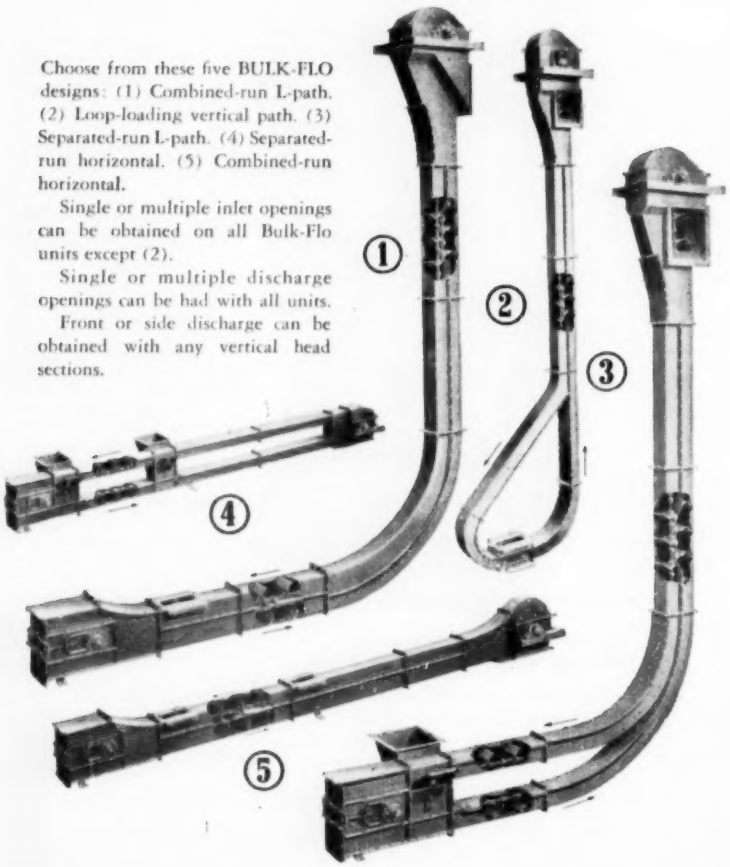
The LINK-BELT BULK-FLO provides positive, gentle movement of material when either fully or partially loaded

Choose from these five BULK-FLO designs: (1) Combined-run L-path. (2) Loop-loading vertical path. (3) Separated-run L-path. (4) Separated-run horizontal. (5) Combined-run horizontal.

Single or multiple inlet openings can be obtained on all Bulk-Flo units except (2).

Single or multiple discharge openings can be had with all units.

Front or side discharge can be obtained with any vertical head sections.



BULK-FLO gives you true versatility in bulk materials handling . . . at lower cost. It replaces several units in less space . . . cuts initial outlay. And because solid flights operate independently of internal pressure, BULK-FLO can be operated at less than full capacity, with positive movement of materials.

That means capacity can be varied by regulating the feed. It also means gentler handling —material is protected in individual "compartments" to minimize degradation.

And note this—regardless of the amount of material being fed, BULK-FLO is self-clearing through intermediate runs. This feature allows you to alternate batches of different materials and prevents contamination.

You can get complete information on BULK-FLO from the Link-Belt office near you. Or write for your copy of Book 2175.

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Get Sound Bus Joints the Easy Way!

Neoprene Boot Simplifies Installation!

Only Allis-Chalmers Switchgear Uses This Method of Bus-Joint Construction

USERS OF ALLIS-CHALMERS Switchgear make or inspect bus joints in a fraction of the time and with none of the mess involved with any other switchgear. Best of all, it's a strong, corona-free joint meeting full impulse levels.

See how simple it is to make the bus joint. It's as easy in the field as it is in the factory. And note the construction details of these rigid joints.

This is but one of many advantages of Allis-Chalmers Switchgear. Get the full story from your nearby Allis-Chalmers district office. Or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3863

HERE'S HOW BUS JOINT IS MADE

1. Bus bar connections are of round edge copper bar with at least 98 percent conductivity. Connections are silver plated to reduce contact resistance, and prevent overheating and oxidation. A combination of spring washers and lock washers assures proper contact of bars at all times. Slotted bolt holes permit expansion and contraction of bus . . . relieve strain on structure.

2. No-corona tape of copper mesh material is applied around the bolts and the overlapping joint. This eliminates corona in the connections and provides a uniform base for the Neoprene rubber boot. Special Neoprene boot with potential transformer tap is provided. A few turns of electrical tape hold the boot in place. No fuss, no muss, no liquid compounds.

ALLIS-CHALMERS

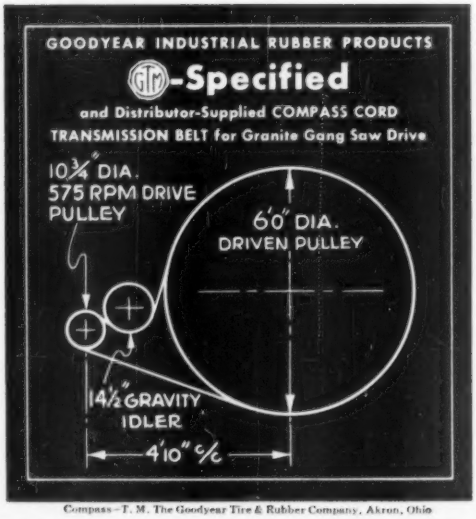
DOUBLED BELT LIFE

by consulting Goodyear Distributor

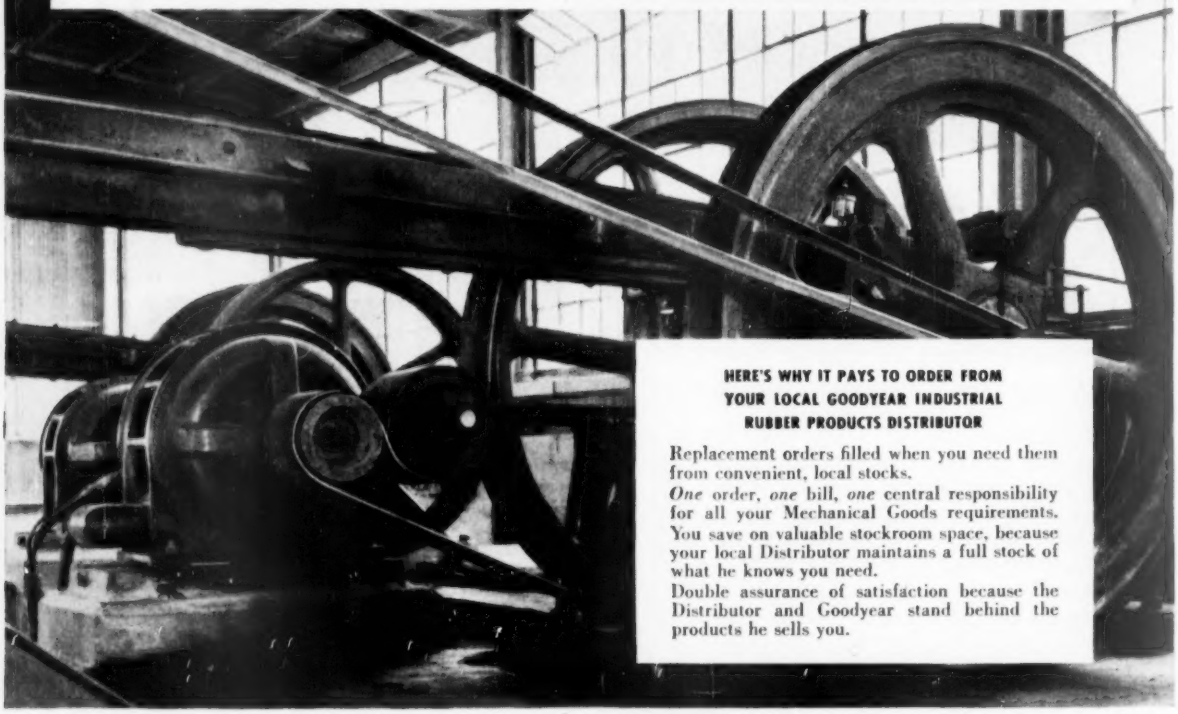
OPERATOR of this granite gang saw called a Goodyear Distributor for help with his flat belt drive. The Distributor came, bringing along the G.T.M.—Goodyear Technical Man—to analyze the drive and make belt recommendations.

The G.T.M. studied the drive, made his engineering recommendations, specified the belts to handle the problem. Result: the COMPASS Flat Belts he recommended delivered two years' service—*double the best previous record*. The Distributor took over—now stocks the exact replacement belts the operator needs—can deliver them right out of stock at any time.

You can get service like this, too—specification of the *right* product and on-call delivery—simply by calling your nearest Goodyear Industrial Rubber Products Distributor. Look for him in the yellow pages of your Telephone Directory—handling Hose, Flat Belts, V-Belts, Packing, Tank Lining, Rubber-Covered Rolls—or write for an introduction to Goodyear, Mechanical Goods Division, Akron 16, Ohio.



Compass—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio



HERE'S WHY IT PAYS TO ORDER FROM YOUR LOCAL GOODYEAR INDUSTRIAL RUBBER PRODUCTS DISTRIBUTOR

Replacement orders filled when you need them from convenient, local stocks.

One order, *one* bill, *one* central responsibility for all your Mechanical Goods requirements.

You save on valuable stockroom space, because your local Distributor maintains a full stock of what he knows you need.

Double assurance of satisfaction because the Distributor and Goodyear stand behind the products he sells you.

GOODYEAR

THE GREATEST NAME IN RUBBER

We think you'll like "THE GREATEST STORY EVER TOLD"—every Sunday—ABC Radio Network THE GOODYEAR TELEVISION PLAYHOUSE—every other Sunday—NBC TV Network

Small Component...
or Complete Unit...
You* can count on
getting whatever
You* need—

Added Evidence
that—

Everyone Can Count on VEEDER-ROOT

This REEL CONTROL BOX, complete with its *built-in* counting mechanism, indicates the number of feet of antenna reeled in and out of certain types of military aircraft. Manufactured completely by Veeder-Root, including outside bakelite cover and box, this unit shows another imaginative application of the universal language of direct-reading *Count*rol.

Now if you, *in any of your defense work,** have a counting problem, then you can count on Veeder-Root to help you in every possible way.

VEEDER-ROOT INCORPORATED
"The Name That Counts"
HARTFORD 2, CONN. • GREENVILLE, S.C.
Montreal 2, Canada • Dundee, Scotland
Offices and agents in principal cities

"Counts Everything on Earth"

Announcing...

NEW SOLID TIRE FOR ELECTRIC POWER TRUCKS

- PROVEN BEST BY TEST!
- REDUCES BATTERY DRAINAGE!
- HELPS REDUCE HANDLING COSTS!
- MINIMUM ROLLING RESISTANCE!

The actual figures

ON ROLLING RESISTANCE . . .

Tire Identification	Rating of Tire Based Upon Amperage Need at	
	50% Load	Normal Load
Tire A	100	100
Tire B	99	94
Tire C	127	Unable to test! Tire stopped machine!
Tire D	94	85
Monarch (Mono-Cushion) Low-Resistance Extreme Efficiency Tire	82	69

● Battery power drainage due to tire resistance is an ever-present problem facing electric powered truck owners. Now, Monarch offers a new cushion tire with lower rolling resistance . . . designed exclusively for electric-powered trucks.

You can see for yourself how efficient this new Monarch Tire operates on electric-powered trucks. The rolling resistance figures at the left prove conclusively this new efficiency tire has the least rolling resistance of any tire available today. These same facts have been confirmed by many truck manufacturers.

The secret? . . . A special compound of low-heat carbon black creates a tire with less resistance and with exceptional physical and rolling properties. No extra power needed as tires begin to wear. Battery charging time is reduced. Less "truck hours" are lost due to battery charging. Material handling costs decline. This new Monarch Tire, exclusively for electric-powered trucks, is well worth your investigation.

THE MONARCH RUBBER COMPANY

550 LINCOLN PARK · HARTVILLE, OHIO

SPECIALISTS IN INDUSTRIAL SOLID TIRES AND MOLDED MECHANICAL RUBBER GOODS

get MORE for your truck dollar from

A combination of fork and low lift platform trucks are used in this large grocery warehouse to gain the advantages of both. This platform truck is making a long haul to the order-picking section. A fork truck will later place the top load on the floor.

because ELWELL-PARKER—

Furnishes ALL types—Elwell-Parker gives *unbiased* advice since it produces both gas and electric trucks. Basic models include high and low lift platform trucks, fork trucks, mobile cranes, tractors.

Builds trucks that cost less to operate—Unequalled design experience cuts maintenance costs and expensive delays due to truck breakdowns.

Offers FREE analysis by materials handling consultants—Resident E-P field men in all principal cities will survey your plant and help you select the most efficient handling system.

Provides service help—E-P Service Engineers make periodic calls to instruct your drivers and advise your maintenance department about proper servicing.

Get the full story on these *Plus Features* by writing for this General Catalog. The Elwell-Parker Electric Co., 4020 St. Clair Ave., Cleveland 3, Ohio.

ELWELL-PARKER
POWER INDUSTRIAL TRUCKS
Established 1893

For copper in any form – For top-notch service – Call Chase

CHASE

What kind of copper or copper alloy do you need? Free-cutting brass rod? Sheet and strip brass? Phosphor bronze for springs? Call your nearby Chase warehouse. We can supply you, subject to government controls, with the widest variety of brass or copper materials for production, maintenance or repair.

Many of our branches are equipped to slit, saw, or shear our metals or your own stocks to specifications.

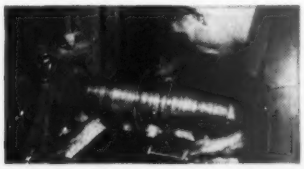
Chase® BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

• *The Nation's Headquarters for Brass & Copper*

Albany†	Cincinnati	Houston†	Minneapolis	Pittsburgh	Seattle
Atlanta	Cleveland	Indianapolis	Newark	Providence	Waterbury
Baltimore	Dallas	Kansas City, Mo.	New Orleans	Rochester†	
Boston	Denver†	Los Angeles	New York	St. Louis	(†sales office
Chicago	Detroit	Milwaukee	Philadelphia	San Francisco	only)

Deliveries to your factory by truck, rail or express, if desired.

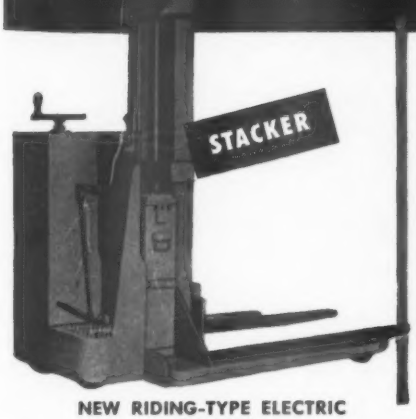


Close tolerance sawing, slitting, shearing to your specifications.

Stocks of tube, rod, bar, strip, sheet and wire in a variety of alloys.

NOW FOR ALL YOUR NARROW-AISLE... CLOSE-QUARTER OPERATIONS

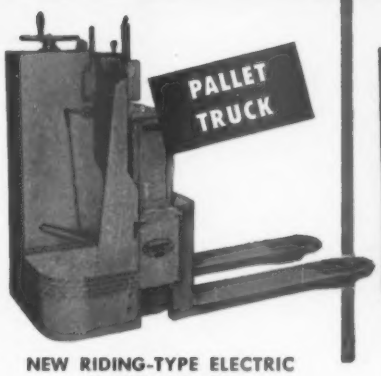
AUTOMATIC'S NEW COMPLETE LINE OF Transveyor RIDING TYPE ELECTRIC TRUCKS



NEW RIDING-TYPE ELECTRIC STACKER

2500 LBS. CAPACITY—48" LONG LOAD
4000 LBS. CAPACITY—48" LONG LOAD

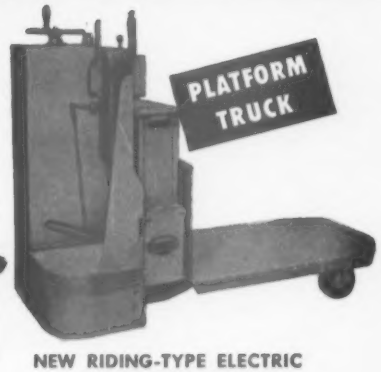
Lightweight, compact, maneuverable, rugged. Answers Industry's need for a low-cost stacker for extreme close-quarter lifting, moving and stacking in 6 foot aisles . . . for operation on limited capacity floors and elevators.



NEW RIDING-TYPE ELECTRIC PALLET TRUCK

4000 LBS. CAPACITY—48" LONG LOAD

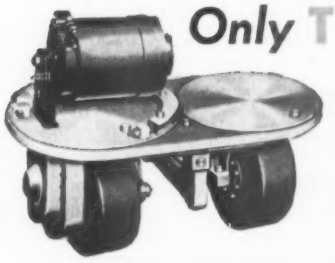
The Transveyor Pallet Truck with an overall length of only 29½" (less forks) makes possible right angle storing of 48" x 48" loads from aisles as narrow as 6½ feet. This means greater utilization of floor space plus quicker access to work areas.



NEW RIDING-TYPE ELECTRIC PLATFORM TRUCK

4000 LBS. CAPACITY

Short, compact and highly maneuverable, the Transveyor Platform Truck speeds operations in congested areas in plant or warehouse and on narrow, crowded shipping docks where both time and space are restricted.



Only Transveyors have Balanced Action!

Balanced Action automatically equalizes the load on both wheels regardless of floor conditions. With conventional rigid axle mounting, uneven floors can cause improper load distribution, chassis distortion, and excessive wear.

But with Transveyor *Balanced Action,* uneven floor surfaces are compensated for by the exclusive center pivoted feature. This eliminates frame distortion and uneven load distribution.

Single steering wheel with uncontrolled action of caster follower may cause excessive tire damage and wear as well as unnecessary chassis vibration.

But with Transveyor exclusive *Balanced Action,* drive and idler wheels are connected by a tie rod and steer simultaneously. This greatly increases tire life by eliminating scrubbing action.

MAIL COUPON TODAY—for free colorful brochures containing diagrams, data, complete specifications on Automatic's New Transveyor line.

Automatic®

WORLD'S LARGEST EXCLUSIVE BUILDER OF ELECTRIC INDUSTRIAL TRUCKS

Automatic® **39 W. 87th Street, Dept. A-3 Chicago 20, Illinois**

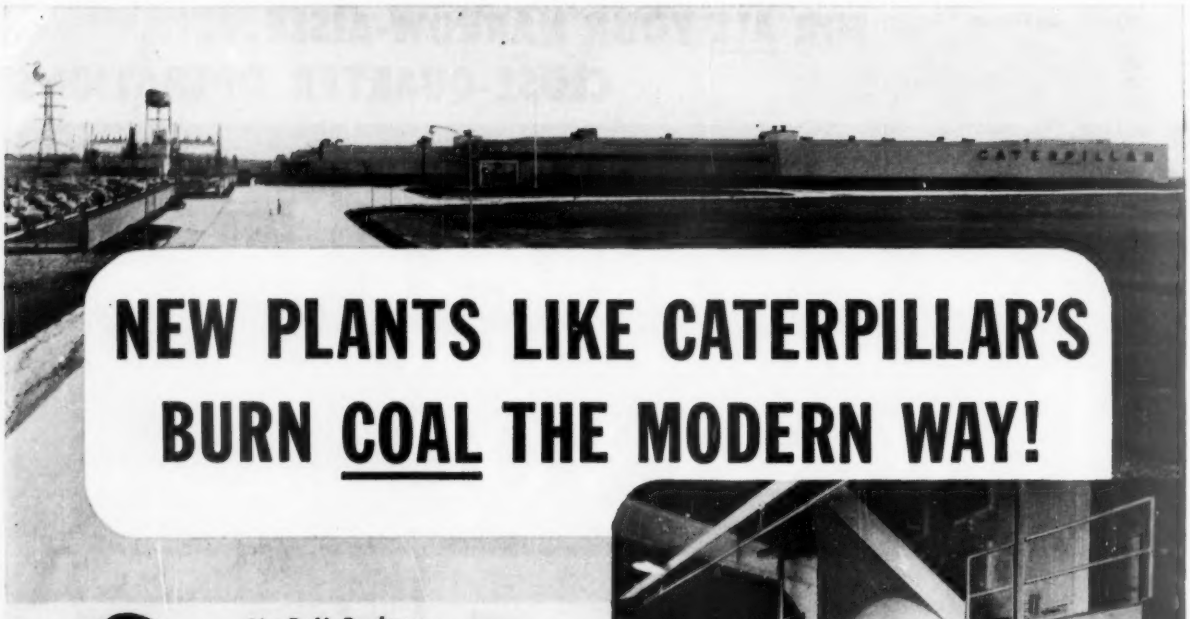
Please send, without obligation, free literature on the new Automatic Transveyors.

Company Name.....

By.....*Position*.....

Street Address.....

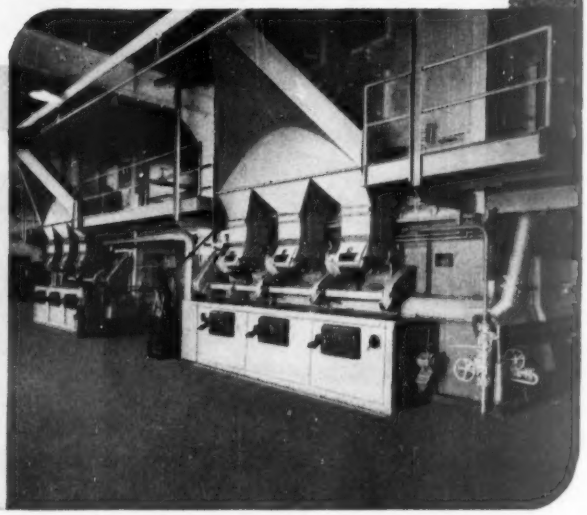
City.....*Zone*.....*State*.....



NEW PLANTS LIKE CATERPILLAR'S BURN COAL THE MODERN WAY!

Mr. R. H. Bachman, Plant Maintenance Engineer, Caterpillar Tractor Co., says:

"Our new plant pictured above was recently completed at Joliet, Illinois. A completely up-to-date coal installation was chosen to handle the heat and process steam requirements. To the right is a picture of the firing aisle showing how the boilers are fed by dust-tight chutes from overhead bunkers. This modern equipment makes coal as clean, convenient, and efficient as a fuel can be! The boilers are rated at 80,000 lbs. of steam per hour, but have handled loads as low as 3,000 lbs. per hour without difficulty."



For big savings, build for COAL! That's a good rule to follow whether you've got a new plant under construction or an older plant being modernized.

Up-to-date coal-burning equipment can give you more steam per dollar . . . modern coal- and ash-handling systems can cut labor costs to a minimum. In addition, coal is the only fuel with virtually inexhaustible reserves. And to mine this coal, to better prepare it for customers' special needs, America has the world's most productive coal industry. Thus, coal users get a double advantage—*dependable supply of an ever better product, at relatively more stable prices.*

For heat, power, process steam—coal is your best bet! Ask a consulting engineer. He'll show you how to cut both fuel and operating costs by burning coal in a modern plant designed to meet your specific needs.

If you operate a steam plant, you can't afford to ignore these facts!

COAL in most places is today's lowest-cost fuel.

COAL resources in America are adequate for all needs—*for hundreds of years to come.*

COAL production in the U.S.A. is highly mechanized and by far the most efficient in the world.

COAL prices will therefore remain the most stable of all fuels.

COAL is the safest fuel to store and use.

COAL is the fuel that industry counts on more and more—for with modern combustion and handling equipment, the inherent advantages of well-prepared coal net even bigger savings.

BITUMINOUS COAL INSTITUTE

A Department of National Coal Association, Washington, D. C.

FOR HIGH EFFICIENCY FOR LOW COST

YOU CAN COUNT ON COAL!

It's not what you pay - it's what it costs

There probably isn't a thing you buy that you couldn't buy cheaper. Provided, that is, you didn't figure the real cost—provided you weren't concerned with getting your money's worth. Right?

But you are concerned. You buy for longer wear. You buy for freedom from trouble. You buy for fewer repairs . . . for more dependable service. You buy equipment to be worked—not to be laid up. You know that thrifty buying isn't merely price-tag buying.

And it's to you, the thrifty buyer, that we like to sell Crane piping equipment. Whether it's a high pressure, high alloy valve or a ½" malleable pipe fitting, every unit in the Crane line is built to last longer with fewer repairs and lower servicing costs. That's why year in and year out thrifty buyers have put more Crane Valves in service than any other make.

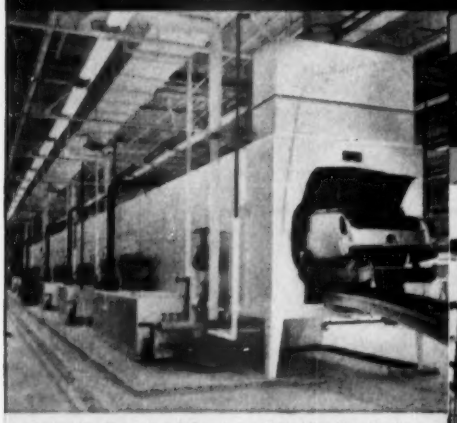
Crane Co., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois. *Branches and Wholesalers Serving All Industrial Areas.*

CRANE

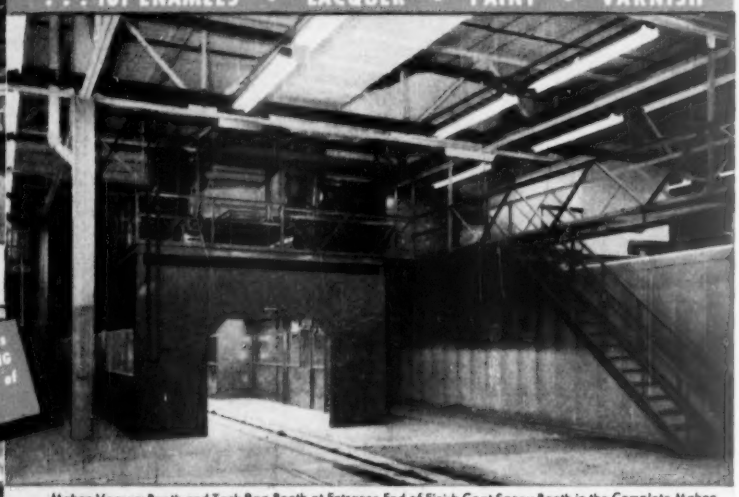
VALVES • FITTINGS • PIPE • PLUMBING • HEATING

COMPLETE *Finishing* SYSTEMS

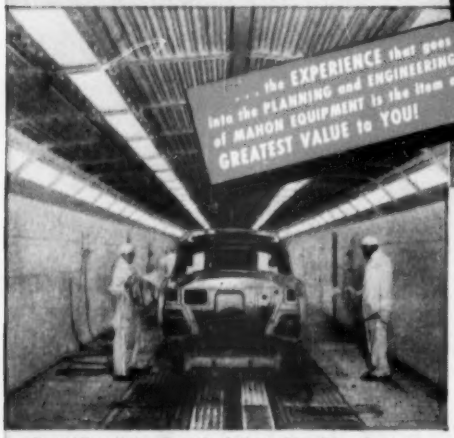
. . . for ENAMELS • LACQUER • PAINT • VARNISH



Mahon Six-Stage Metal Cleaning and Rust Proofing Machine —Part of the Complete Mahon Body Finishing System at the Lincoln-Mercury Plant, Wayne, Michigan.



Mahon Vacuum Booth and Tack Rag Booth at Entrance End of Finish Coat Spray Booth in the Complete Mahon Body Finishing System at the Lincoln-Mercury Plant, Wayne, Mich. Finish Coat Bake Oven Appears at Right.



One of Four Mahon Down-Draft Hydro-Filter Spray Booths in the Complete Mahon Body Finishing System at the Lincoln-Mercury Plant, Wayne, Michigan.

Air Conditioned Pressurized Enclosures Fitted with Plate Glass Protect Bodies from Dust while moving from Spray Booths to Finish Baking Ovens at the Lincoln-Mercury Plant.

Complete, Ultramodern MAHON SYSTEM Assures FINE BODY FINISH at LINCOLN-MERCURY!

In the new Lincoln-Mercury plant at Wayne, Michigan, the exceptionally fine finish on both Lincoln and Mercury bodies is produced in a complete Mahon Finishing System. The system is ultramodern in every respect. Included in it are the latest developments in production equipment of this type—all designed to produce greater operating efficiency and to reduce unit cost of finishing to an absolute minimum. The fact that the Mahon Company was selected to engineer, build and install this equipment is significant, yet it is not unusual in the automobile industry . . . because, a survey will show that in the automotive field and the home appliance field, where fine finish is imperative, there are more Mahon Finishing Systems than all other types combined. If you are contemplating new finishing equipment, you, too, will find that Mahon engineers are better qualified to determine your equipment requirements, and to do the all-important planning and engineering which is the key to high quality results in production finishing. Over thirty years of experience in this highly specialized field, coupled with constant research and development, have endowed Mahon engineers with a wealth of technical knowledge and practical know-how not available to you elsewhere. See Mahon's Insert in Sweet's Plant Engineering File for complete information, or write for Catalog No. A-653.

THE R. C. MAHON COMPANY

HOME OFFICE and PLANT, Detroit 34, Mich. • WESTERN SALES DIVISION, Chicago 4, Ill.

Engineers and Manufacturers of Complete Finishing Systems—including Metal Cleaning and Pickling Equipment, Metal Cleaning and Rust Proofing Equipment, Hydro-Filter Spray Booths, Filtered Air Supply Systems, and Drying and Baking Ovens; Core Ovens, Heat Treating and Quenching Equipment for Aluminum and Magnesium, Dust Collectors and other units of Special Production Equipment.

MAHON

You save money on Paint... You save money on Labor... When you Paint with

When you look at the price tag of a gallon of Barreled Sunlight you well might wonder how Barreled Sunlight could cut your maintenance painting costs. But when you look at the facts . . . facts based on performance . . . you begin to see the light.

We admit, Barreled Sunlight might cost a few pennies more per gallon than many other good paints. But it takes more thinner . . . much more . . . as much as 1 gallon of thinner for every 5 gallons of Barreled Sunlight. You save money by buying less paint.

And of far greater importance, with Barreled Sunlight you save money on *labor*, which is the big 80% factor of your maintenance painting costs. Barreled Sunlight goes on faster. It has greater spreading capacity, better hiding power. It gives you a better looking, longer lasting job in less time and for less cost than any other paint on the market.

Write and our representative will show positive proof with his simple on-the-wall test.

Get Your Free Copy NOW! For full information on all Barreled Sunlight Maintenance Finishes . . . as well as Barreled Sunlight's new and advanced Engineered Color Plan . . . write today on your company letterhead for this new Barreled Sunlight Catalog. No charge. No obligation.

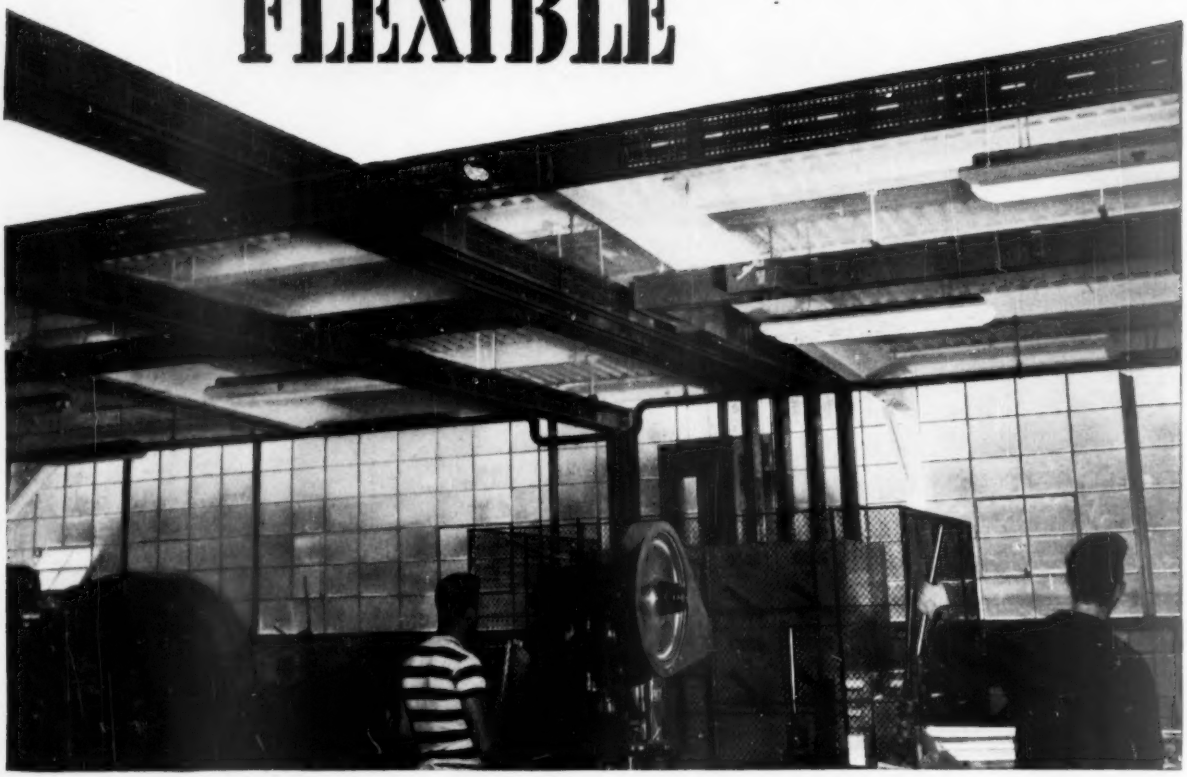
BARRELED SUNLIGHT PAINT COMPANY
2-A Dudley St., Providence, R. I.

Barreled Sunlight Paints®

In whitest white or clean, clear, wanted colors, there's a Barreled Sunlight Paint for every job

For over half a century those who know the best in paints . . . for all types of buildings . . . have strongly insisted on famous Barreled Sunlight

BUS DUCT IS FLEXIBLE



"It's So Flexible To Plant Layout..." says The Randall Company

The Randall Company officials stated, "It's so flexible to plant layout and production line shifts that it's just what we need for future changes and expansion."

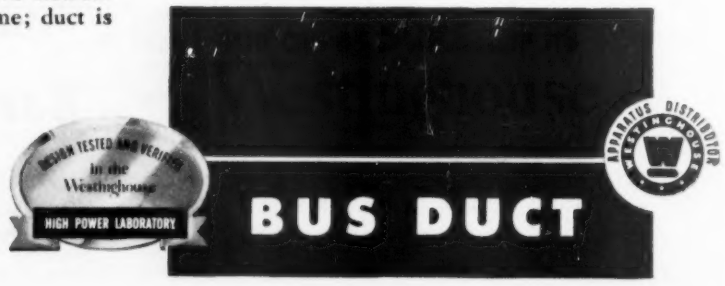
"The ease of installing your Bus Duct was amazing . . . it saved us both time and money," said the contractor, Mr. Edward P. Fogarty, President of Fogarty Electric Company, Cincinnati, about this job.

This large installation of Westinghouse Low Impedance and Plug-In Bus Duct is in the Randall Company plant at Wilmington, Ohio. It is assembled from standardized sections that allow rapid dismantling and reassembly without waste of time; duct is fully salvageable.

Up to 5,000 amperes, Westinghouse Bus Duct provides more power per pound of equipment than any system of wireway, cable or conduit. Four types are available to handle all load requirements, meet all service conditions in your plant or building from power source to outlet.

Get complete facts by calling your Westinghouse Distributor or write for B-4272-A, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

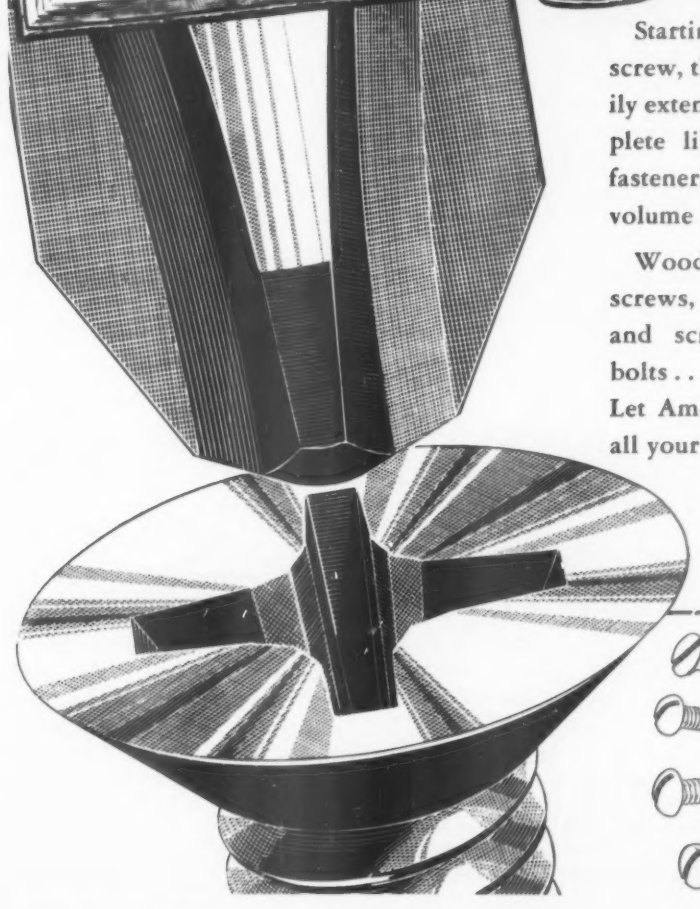
J-30108



THE AMERICAN STORY

CHAPTER 4:

"The Eagle Spreads Its Wings"



Starting with the early patents on the wood screw, the eagle's wingspread has been steadily extended so that now American has a complete line of Phillips, slotted and special fasteners . . . with prompt delivery in any volume to any part of the country.

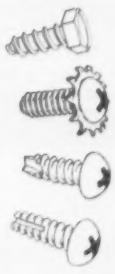
Wood screws, machine screws, tapping screws, thread-cutting screws, lock washer and screw assemblies, hex head screws, bolts . . . or what have *you* in mind right now? Let American lend an experienced hand on all your fastening problems.

AMERICAN SCREW COMPANY

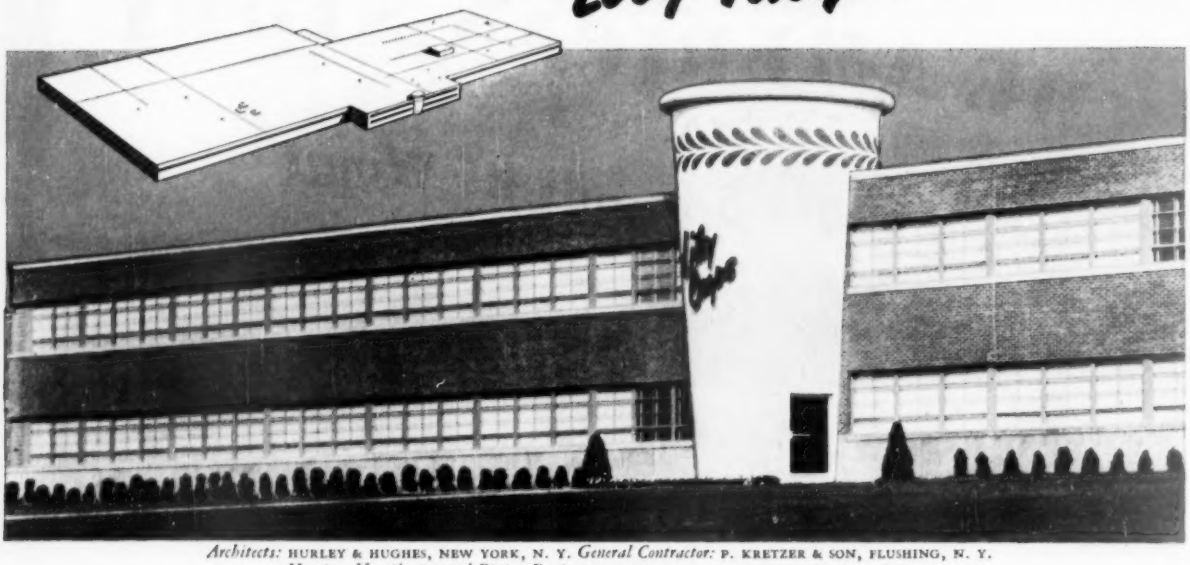
PHILLIPS HEADquarters

WILLIMANTIC, CONNECTICUT

Main Office & Plant
Willimantic, Conn.
Office & Plant, Norristown, Pa.
Office & Warehouse, Chicago, Ill.



newest *Lily-Tulip* plant



Architects: HURLEY & HUGHES, NEW YORK, N. Y. *General Contractor:* P. KRETZER & SON, FLUSHING, N. Y.
Heating, Ventilating and Piping Engineers: ABBOTT, LESTER & CO., NEW YORK, N. Y.

equipped with JENKINS VALVES for peak operating efficiency

"All this to make a paper cup!" exclaim visitors, viewing the more than 1000 ft. long modern plant of the Lily-Tulip Cup Corporation completed recently in Springfield, Mo. Even more impressive is the amount of long-range planning required to attain and *maintain* peak operating efficiency in so massive a building.

With its eleven different service pipelines, as well as a giant air-conditioning and humidity control system, the choice of valves for this plant required future-minded planning. Only after careful comparison of performance in all types of services, and of maintenance economy records, was the decision made to standardize on Jenkins Valves.

This confidence in the demonstrated *extra measure* of efficiency and economy provided by Jenkins Valves is shared by plant operating management in every type of industry.

Despite this extra value, *you pay no more* for Jenkins Valves. For new installations, for all replacements, let the Jenkins Diamond be your guide to lasting valve economy. Jenkins Bros., 100 Park Ave., New York 17.

JENKINS
LOOK FOR THE DIAMOND MARK
VALVES
SINCE 1864 TRADE JENKINS MARK
Jenkins Bros

Miles of piping includes service lines for water, steam, gas, compressed air, vacuum and liquid paraffin, as well as fire protection lines with 4,500 sprinkler heads. Gate valves on water lines feeding the evaporative roof cooling system are shown above, some of the thousands of Jenkins Valves installed at control points throughout the plant.

Stacking a stabilized load of weather-protected cans at United Can & Glass Co., Haywood, Calif.

TOWMOTORS IN ACTION IN U. S. INDUSTRY

Use your air rights...

on pier, in plant, outside or warehouse-wide . . . let Towmotor stack space-eating loads, up where you've storage capacity to spare. Speeding the handling of *all* materials, Towmotor saves its cost in a matter of months — then *you* profit by that big earning power throughout many busy years. You'll see the proof, right from the start, in stepped-up output per man-hour. Chart your course for maximum production with the help of a copy of "Man-Hour Thieves." Write for yours *now* and name of your nearest Towmotor Representative. Towmotor Corporation, Div. 501, 1226 E. 152nd St., Cleveland 10, Ohio.

TOWMOTOR
THE ONE-MAN-GANG®

FORK LIFT TRUCKS AND TRACTORS
Since 1919

RECEIVING • PROCESSING • STORAGE • DISTRIBUTION

"Experience showed us how **FUSETRON FUSES** Prevent Motor Burnouts . . . now we protect all Motors on our Units with them!"

Franklin Van Reed
Production Engineering Supervisor
ORR & SEMBOWER, INC., Reading, Penn.

"Here's what Happened in our Plant"

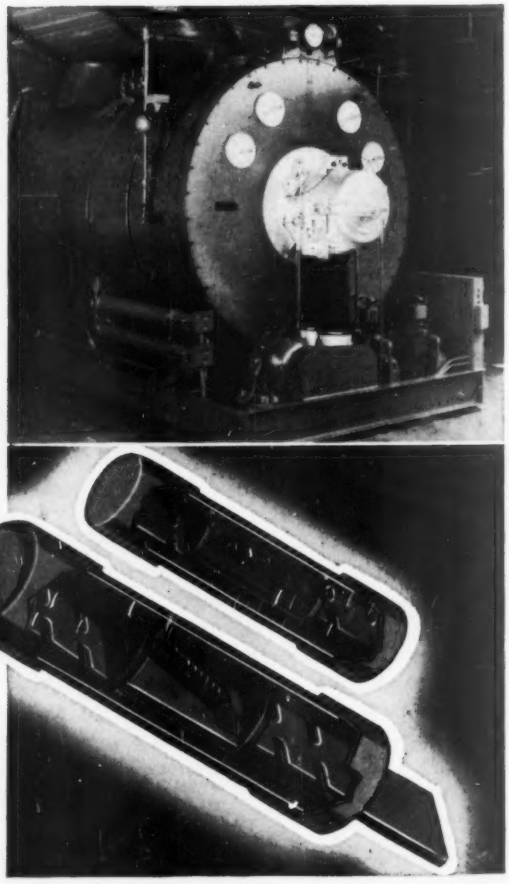
Back in January of 1951 we had a motor on a pump that was supposed to draw a maximum load of about 8 amperes, yet it began blowing FUSETRON fuses of motor protection size.

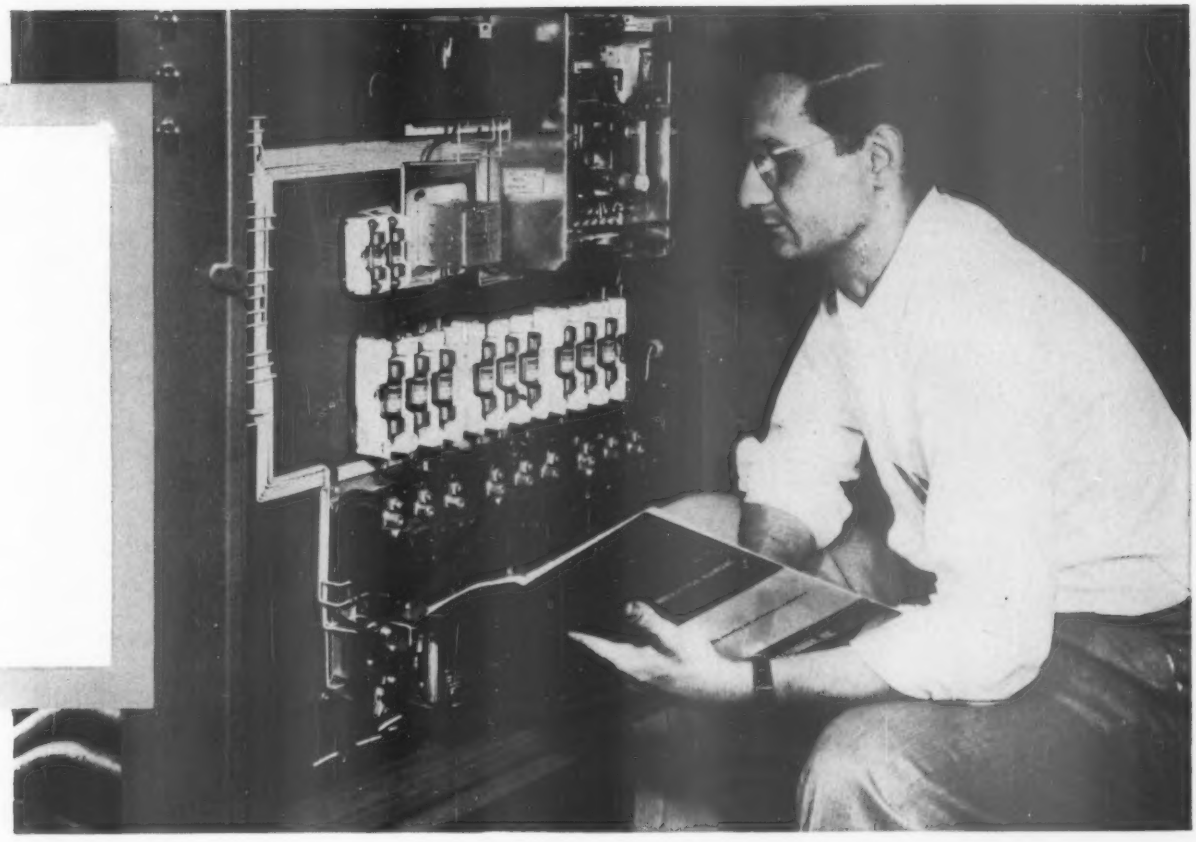
"We were inclined to believe something was wrong with the fuses — but after checking with an ammeter we found that an automatic relief by-pass was sticking and causing the motor to draw about 12 amperes.

"If the Fusetron fuses had not opened, the motor would undoubtedly have burned out.

"Now on all our Powermaster Steam Generator Units we use Fusetron Fuses to protect the motors on the fuel pump, the boiler feedwater makeup pump, and the air compressor."

Franklin Van Reed
Production Engineering Supervisor
ORR & SEMBOWER, INC.,
Reading, Pennsylvania





You, too, can profit by the

10 POINT PROTECTION of Fusetron Dual-Element Fuses . . .

1. Protect against short-circuits.*
2. Protect against needless blows caused by harmless overloads.
3. Protect against needless blows caused by excessive heating — lesser resistance results in much cooler operation.
4. Provide thermal protection — for panels and switches against damage from heating due to poor contact.
5. Protect motors against burnout from overloading.
6. Protect motors against burnout due to single phasing.
7. Give DOUBLE burnout protection to large motors — without extra cost.
8. Make protection of small motors simple and inexpensive.
9. Protect against waste of space and money — permit use of proper size switches and panels.
10. Protect coils, transformers and solenoids against burnout.

*Fusetron Fuses have high interrupting capacity as shown by tests of the Electrical Testing Laboratories of New York City in December 1947.

FUSETRON is a trade mark of the Bussmann Mfg. Co., Division of McGraw Electric Co.

THE MONEY YOU SAVE . . . by preventing one **needless** shutdown, one **lost** motor, one **destroyed** switch or panel or one **burned out** solenoid . . . MAY MORE THAN PAY FOR the replacement of all your ordinary fuses with Fusetron dual-element Fuses.

THIS COUPON WILL BRING YOU complete information about the All-Purpose Protection of FUSETRON Dual-Element FUSES

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

Bussmann Mfg. Co., University at Jefferson, St. Louis 7, Mo. (Division of McGraw Electric Co.)

Please send me complete facts about FUSETRON dual-element Fuses.

Name _____

Title _____

Company _____

Address _____

City & Zone _____ State _____ 153

How Norton brings you the "TOUCH OF GOLD" that adds more value to every grinding job

Grinding, the most universal, most basic of all production processes, is the true "Touch of Gold" that increases the usefulness — and the value — of every manufactured article. That's what happens every time Norton grinding wheels touch the grinding jobs *you* do.

Here are the facts on how Norton leads the field in producing and improving the "Touch of Gold" for you and for all industry.

FIRST IN SIZE

At "Norton City" you'll find over a mile of buildings and thousands of skilled workers, constituting the greatest single supply source of abrasives and abrasive products — world headquarters for your "Touch of Gold". Here also is the world's newest, most modern grinding machine plant, and the famous Norton School of Grinding.

FIRST IN RESEARCH

At Norton over 100 trained technicians, in 19 specialized laboratories, are constantly engaged in product improvement and application. This includes not only the development of new abrasives, bonds and processing techniques, but cooperation with customers in the solution of everyday grinding problems. For the "Touch of Gold" that will solve your own grinding difficulties, look to the organization that leads all others in abrasive development. Look to Norton!

Make sure your grinding gets the top value-adding "TOUCH OF GOLD" — with Norton abrasive products

From Norton laboratories come "TOUCH OF GOLD" exclusives like these

Norton New-Process Wheels are unequalled for uniform structure, identical performance and long, even wear.

32 ALUNDUM* Abrasive, another Norton "first", is one of the most revolutionary developments in abrasive history.

NORBIDE* Abrasive, hardest man-made material, replaces costly diamond dust in many polishing and lapping jobs.

FIRST IN PRODUCT-RANGE

Norton offers you the most complete line of abrasive products, all manufactured to strictest quality control standards. Norton ALUNDUM* abrasives and CRYSTOLON* abrasives, together with Norton-developed bonds, make available hundreds of thousands of grinding combinations.

FIRST IN SERVICE

1. Your Norton Abrasive Engineer is skilled in every detail of grinding wheel manufacture and application. He's ready to go into your plant, study your grinding problems and help you find the money-saving answers.

2. Norton Warehouses are located in key industrial centers. Each contains huge stocks, highly trained personnel and special wheel alteration equipment. And they are backed by the huge stocks at Worcester — further assurance that you'll get Norton wheels whenever you need them, wherever you're located.

3. Your Norton Distributor, with plenty of practical experience, can give you valuable help in selecting the right Norton wheels. Your distributor is careful to maintain always adequate stocks, selected to meet the particular needs of your area. He is your direct connecting link with the entire Norton organization — world headquarters for the "Touch of Gold" that means more profitable grinding for *you*. NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

NORTON
ABRASIVES
Making better products to make other products better

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

ROUGH GRINDING

SURFACE GRINDING

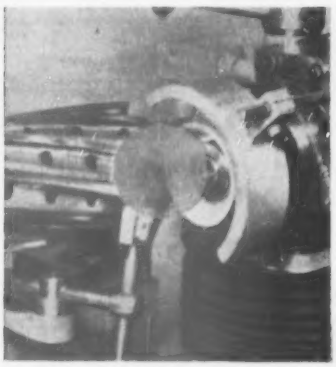
O. D. GRINDING

INTERNAL GRINDING

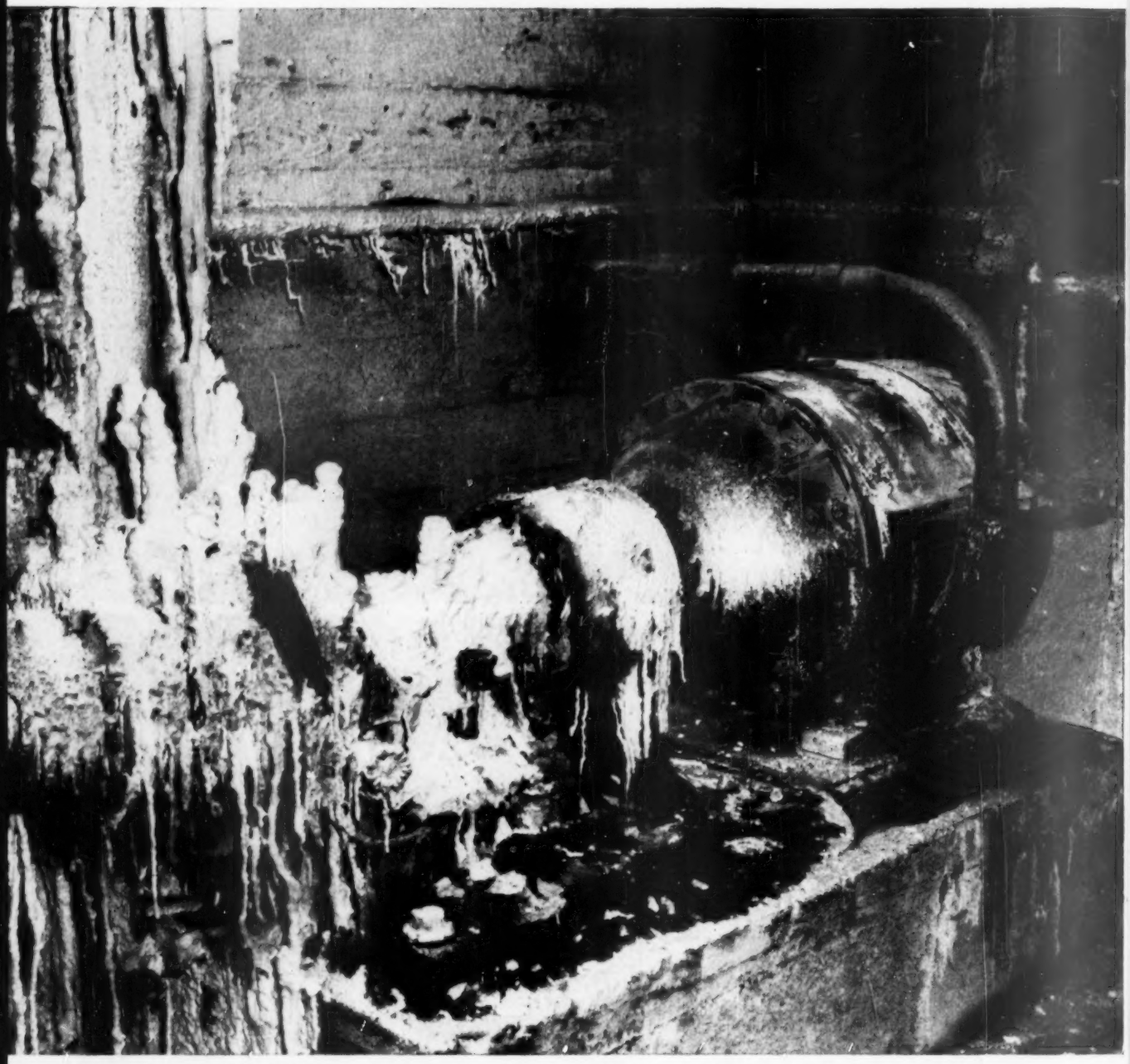
CUTTING-OFF

DIE AND MOLD GRINDING

BARREL TUMBLING


TOOL AND CUTTER GRINDING

WHEN JOBS ARE TOUGH



CORROSIVE ATMOSPHERE doesn't bother this standard, "off-the-shelf" Tri-Clad motor. Totally enclosed, fan cooled, it runs 12 hours a day, six days a week, driving a flash cooler pump under tough conditions in a chemical plant.

GENERAL ELECTRIC

INDUSTRY DEPENDS ON G-E TRI-CLAD MOTORS

REG. U.S. PAT. OFF.

Here are three typical tough jobs being done safely, economically, and without interruption, by G-E Tri-Clad motors. They help show why more than 10,000,000 horsepower of G-E Tri-Clad motors are serving American industry today.

WIDEST VARIETY

With the widest selection of standard motors obtainable anywhere, the Tri-Clad motor line offers ratings up to 2000 hp; all types of enclosures; gear motors, brake motors, and adjustable-speed drives—plus many other mechanical and electrical modifications to meet your requirements.

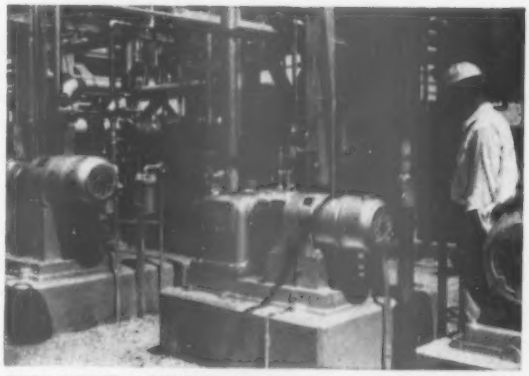
TRIPLE PROTECTION

You get triple protection with *every* Tri-Clad motor—against physical damage, electrical breakdown, and operating wear and tear. Completely enclosed bearings last longer because they can be relubricated if necessary—and *without shutdown!* For specific product information, use the coupon below, or contact your nearby G-E Apparatus Sales Office, authorized G-E Agent or Distributor.

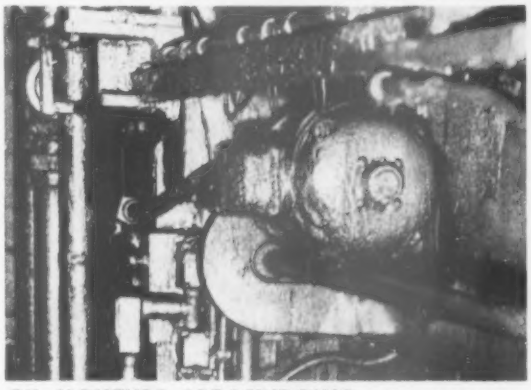
IMMEDIATE DELIVERY

Most standard G-E Tri-Clad motors are available immediately from stock. And the most complete sales and service network in the motor industry assures you prompt service by trained specialist and application engineers, for all your motor problems. General Electric Co., Schenectady 5, New York.

752-16



EXPLOSIVE ATMOSPHERE dangers are avoided by using standard explosion-proof Tri-Clad motors, such as these gear-motors driving water and hydrocarbon pumps in an oil refinery.



OIL, MOISTURE, ABRASIVE DUST can't stop this totally-enclosed Tri-Clad motor, operating below the strip in a cold strip steel mill. Motor is completely protected inside and out.

PROGRESSIVE MECHANIZATION . . .

a new G-E MORE POWER TO AMERICA program—motion picture and manual—case histories of the latest mechanization trends.

Send for literature.

Section N 752-16
General Electric Co., Schenectady 5, N. Y.

Please send me the following on Progressive Mechanization:

☐ Free copy of the Progressive Mechanization Manual (GEA-5789)

Please send the following product bulletins:

☐ GEA-3580 (Open Drippproof Motors)

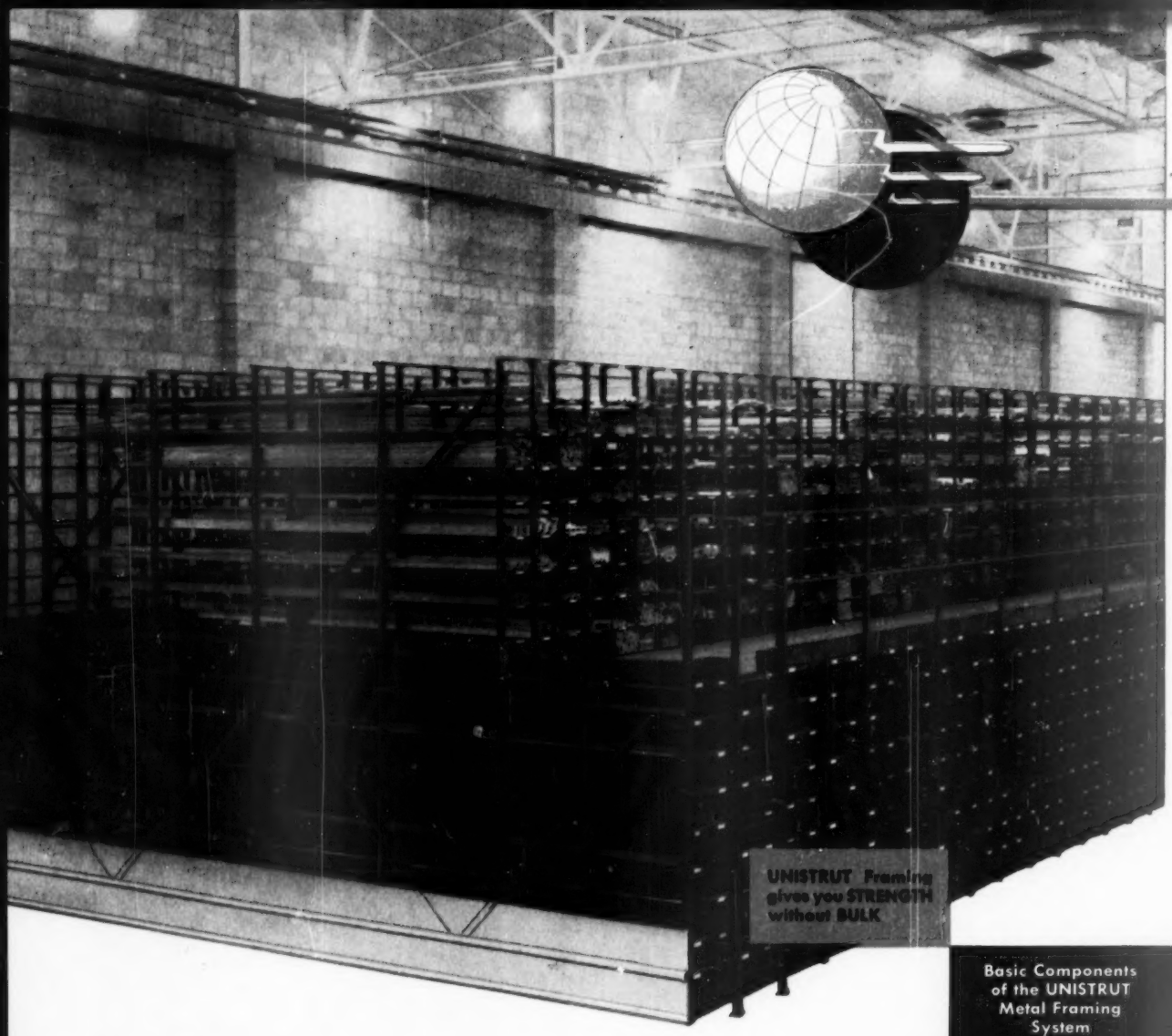
☐ GEA-4400 (Totally Enclosed Motors)

Name .....

Firm .....

Address .....

City ..... Zone ..... State .....



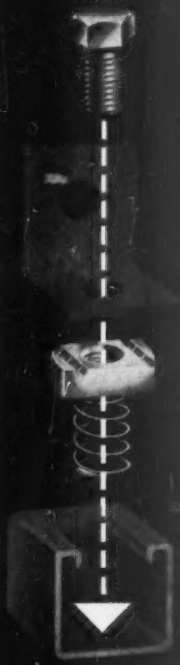
UNISTRUT *Racks easy to assemble!*

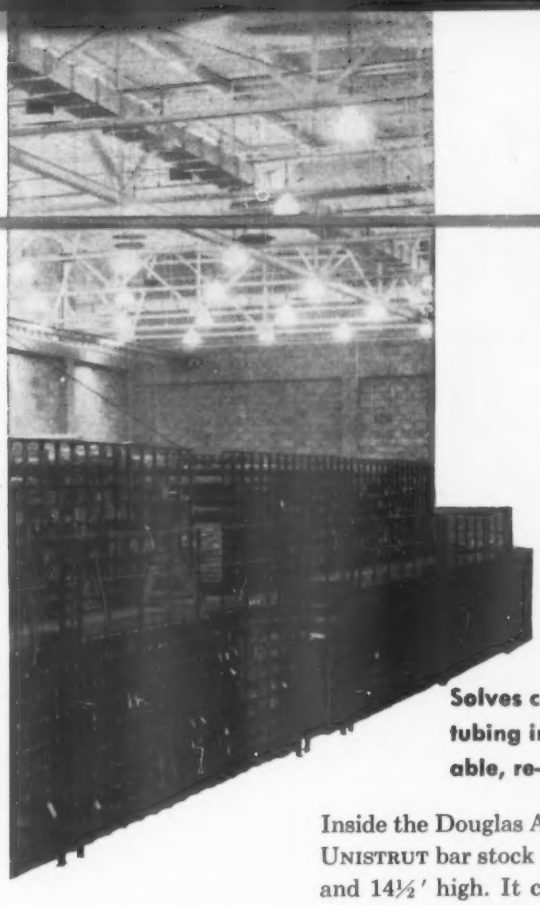
Only a few fittings are required to erect UNISTRUT bar and tubing racks. The fittings used to build the rack pictured are shown below. Other fittings are available to meet any problem you may have in building with UNISTRUT products.

UNISTRUT Products are Bonderized

Only 7 types of fittings needed to build this rack!

Basic Components of the UNISTRUT Metal Framing System





Douglas Aircraft's Giant UNISTRUT® Storage Rack

Supports 4700 tons of BAR STOCK!

Solves complex problem of storing and handling bars, rounds, tubing in limited space. Installed quickly at low cost. Adjustable, re-usable and completely safe.

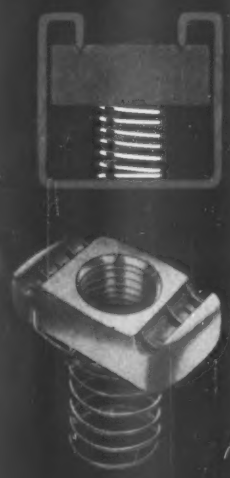
Inside the Douglas Aircraft Company's El Segundo, California plants are the largest UNISTRUT bar stock racks ever built. The one shown here is 132′ wide, over 25′ deep and 14½′ high. It contains 2376 individual compartments 9½″ high by 12″ wide, and has a total load capacity of 9,400,000 pounds!

The lower tiers are used for steel storage, including bars, rounds and structural members. The upper tiers carry aluminum and magnesium extrusions and various types of metal tubing.

This is the largest of several sizable UNISTRUT racks installed by Douglas Aircraft, including pallet and other type racks, which have helped to increase the flow of materials for this important aircraft producer.

UNISTRUT racking systems conserve valuable floor space, cut labor and handling expense and provide a construction material that can be used again and again without additional investment. Adjustable UNISTRUT framing requires no drilling, or welding, and can be built by men without special skill or experience. It's in use today in thousands of factories, mills, warehouses, laboratories, shops and storerooms of hundreds of the largest companies in the world—why not investigate its savings potential for your business?

No Drilling, No Welding, 100% Adjustable and Re-usable



New improved nut!

Only UNISTRUT offers this Spring-Held Clamping Nut which ties together both sides of slotted channel to form a box section at points of connection for greater load strength.

Distributors and Warehouse Stocks in Principal Cities — Consult your Telephone Directories

U. S. Patent Numbers: 2327587; 2329815; 2345650; 2363382; 2380379; 2405631; 2541908. Other Patents Pending

THE WORLD'S MOST FLEXIBLE ALL-PURPOSE METAL FRAMING

Write for 24-page UNISTRUT Rack Catalog No. 600. 24 pages, fully illustrated—"Racks you can build with UNISTRUT Metal Framing." Includes full description of 46 different kinds of UNISTRUT racks, what UNISTRUT framing is, how it's used, and complete ordering information.

UNISTRUT PRODUCTS COMPANY
1013 W. WASHINGTON BLVD.
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Please send me a copy of Rack Catalog No. 600, without obligation.

Name_____

Company_____

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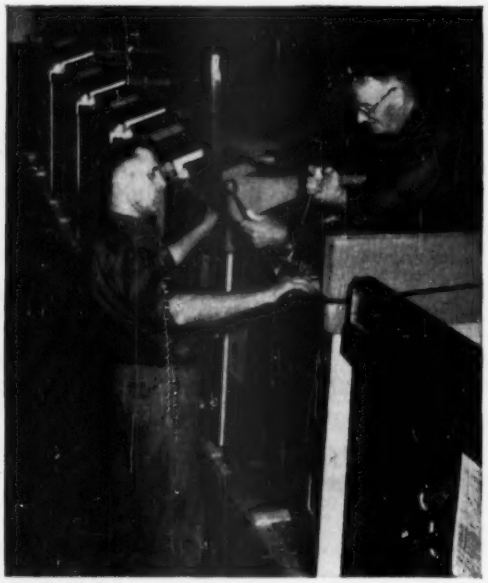
Acme Steel Strapping Insures S.A. *(Safe Arrival)*

and eliminates Crating Department bottleneck for Hotpoint!



"BEFORE" HOTPOINT RANGE PRODUCTION LINE STALLED. Hotpoint workers found the hand stretcher method (shown above) too awkward in fastening corrugated board for shipping protection to new ranges as they poured off the production line. The line kept backing up.

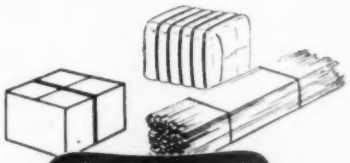
"NOW" ACME STEEL PNEUMATIC STRETCHER ELIMINATES BOTTLENECK, CUTS COSTS! The same workers now tension pre-cut Acme Steel strapping with an Acme Steel pneumatic stretcher. Shipping preparation costs have been held as much as 20 per cent below normal industry shipping costs. One operator says, "A man couldn't last all day before—too hard on the arms. Now with the Acme Steel system it's easy to keep ahead of production."

There it is. A clear cut case of how Acme Steel and know-how in steel strapping has helped a leading manufacturer solve a critical problem.

Chances are that many of your own production assembly or packing and loading problems can be cleared up with Acme Steel strapping, the best way to protect your product in shipment.

You will also learn that Acme Steel strapping, and the Acme Steel tools that work with it, will save materials and pay for themselves in a short time. Employees are happier because they know increased production means more, steadier jobs.

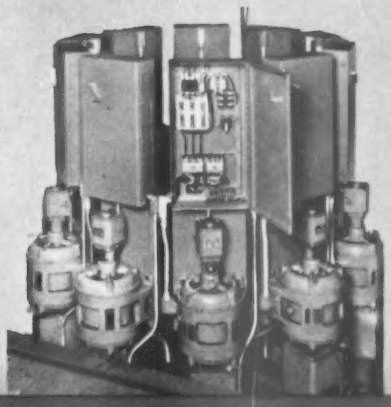
There are dozens of cases in the files to prove that nearly everything made to eat, wear, sit on or live in can be assembled and packed swiftly and will arrive safely with Acme Steel strapping. For specific examples, write to Acme Steel Products Division, Dept. FMM-13.



ACME STEEL

ACME STEEL COMPANY

2849 ARCHER AVENUE, CHICAGO 8, ILL.



SPEEDYELECTRIC STEAM-JET CLEANER—a compact "RA" Starter makes possible a neat surface mount for easy access.

ALLEN TAPPER & THREADER—convenient-ly located panels house "RAB" Starters controlling the reversing spindles.

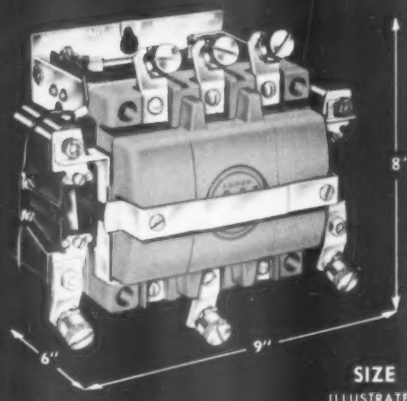
TWIN-TOOL GRINDER—A-H Controls mounted on the side are near, convenient to the operator, easily accessible.

ARROW AH HART

ARROW-HART MOTOR STARTERS AND CONTACTORS

Serve Better and Longer

WITH MORE OUTSTANDING FEATURES



SIZE 3
ILLUSTRATED

JUST ½ THE SIZE and WEIGHT

— permits smaller control panels and cavities, better layout.

EASY INSTALLATION

— straight-thru wiring saves **30%** time and work, circuits are easier to identify.

EASY MAINTENANCE

— front-wired terminals . . . contacts readily accessible.

MORE EFFICIENT

— exclusive knee-action, bellcrank fulcrum mechanism multiplies leverage, increases contact pressure, takes less space.

GREATER ARC RESISTANCE

— by **55%** with alkyd type base and hood . . . individual arcing chambers.

HEAVY-DUTY CONTACTS

— positively aligned. Vertical operating position — sheds breakdown materials.

Better service is ***built into*** A-H Motor Controls. Not with just minor improvements, but through a new concept of motor control design . . . exclusive with Arrow-Hart. A functionally simple design, it skillfully balances all components for greatly increased efficiency. It's years ahead in providing dependable operation, maximum rated performance and long life. These outstanding advantages are available today as replacements for obsolete design or for improved product design of original equipment. Take the first step — buy a Type "RA" Motor Starter or Contactor, and compare it with the conventional type of controls.

SIZES AND TYPES ON THE REVERSE SIDE.

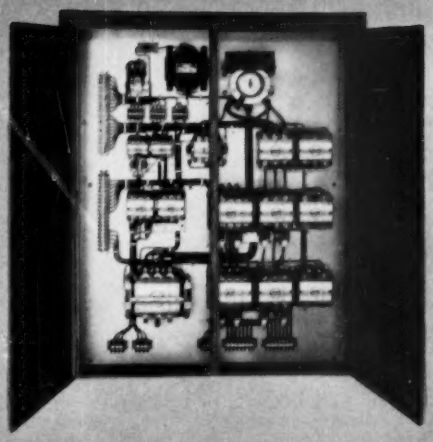
BUY WITH CONFIDENCE • PROFIT BY PERFORMANCE

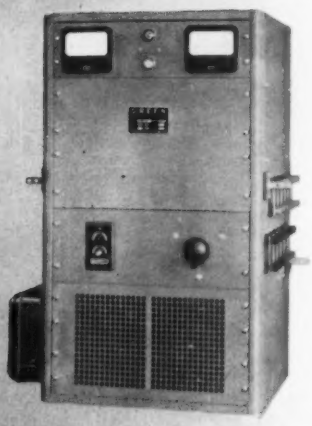
THE ARROW-HART & HEGEMAN ELECTRIC CO., HARTFORD, CONN., U.S.A.

ELECTRICAL CONTROLS

ARROW AH HART

ESTABLISHED IN 1890





MALSBARY STEAM CLEANER — the much smaller "RA" Starter leaves more room for other components.

BATH CONTOUR FORMER CONTROLS — a panel just 36" x 44" x 10" holds 3 Size 00 and 2 Size 0 Contactors, a Size 2 and a Size 4 Starter, a Size 1 and a Size 2 Reversing Starter, 2 Size 3 Two-Speed Starters and a Size 3 Reversing Contactor.

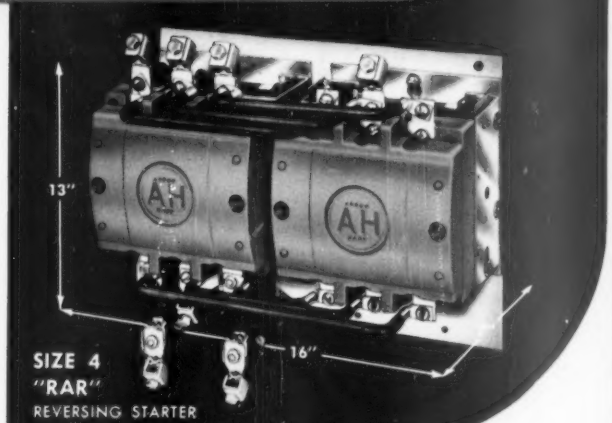
GREEN MULTI-RECTIFIER — dependable control is assured by a "CRA" Contactor and A-H Push Buttons.

More and More PROGRESSIVE Companies are buying ARROW-HART MOTOR CONTROLS

ARROW AH HART

A Complete Line

Type "RA" Starters are supplied in sizes 0, 1, 2, 3, 4 and 5, including "RAR" and "RAS" Reversing and Two-Speed Starters, "RAC" Combination Starters, and "RCAR" Combination Reversing and "RCAS" Two-Speed Starters. There's a full range of NEMA enclosures for general service and for hazardous and exposed locations, including EXPLO-SAFE explosion and weatherproof housings. Type "CRA" Contactors are supplied in sizes 00, 0, 1, 2, 3, 4 and 5, including "RARC" Reversing Contactors.



SIZE 4
"RAR"
REVERSING STARTER

You'll find ratings, dimensions, weights and complete engineering data in the Arrow-Hart Catalog: INDUSTRIAL MOTOR CONTROLS. To receive your copy, just fill in and mail the coupon below.

INDUSTRIAL CONTROL DIVISION
THE ARROW-HART & HEGEMAN ELECTRIC COMPANY
103 HAWTHORN STREET, HARTFORD 6, CONN.

Please send my copy of the new catalog:

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MY NAME_____

POSITION_____

CO. ADDRESS_____

CITY_____ ZONE_____ STATE_____

ARROW-HART

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103 HAWTHORN STREET
HARTFORD 6, CONN., U.S.A.

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Also Sales Engineers in Columbus Ohio, Fayetteville New York, Manchester Ct., Seattle, Springfield Mass. In Canada: ARROW-HART & HEGEMAN (CANADA) LTD., MT. DENNIS, TORONTO.

It's ready NOW!

Yale's new Warehouser

Here's the narrow aisle straddle-type truck you've waited for... more efficient—far safer—thanks to new improved YALE design.

ELECTRIC POWER—and power to spare! There's almost no warehouse job that can't be done more efficiently and at lower cost with one man and the remarkable, trouble-free YALE Warehouser.

SHORTER LENGTH AND ROUNDED REAR END allows right-angle tiering in aisles 6′ wide or less...doubling, tripling your present storage facilities without a cent of costly construction or remodeling.

LIGHTER WEIGHT—The YALE Warehouser is perfect for use over low-load capacity flooring...in elevators and on ramps...any place in older, unreinforced buildings.

SAFER SCIENTIFIC DESIGN places controls in center of truck for driver protection...provides a single hydraulic lifting cylinder for far better visibility ...gives never-failing "Dead Man" control that applies brakes and shuts off power the instant operator leaves truck.

Yes, the YALE *Warehouser is the practical, money-saving answer to your modernization program. If you are considering new construction or the remodeling of your present storage facilities, consult with* YALE...*learn how this new, improved truck can help you get more use from every square unit of storage space.*

MAIL THIS COUPON TODAY

The YALE & TOWNE Manufacturing Co., Dept. 31
Roosevelt Blvd. and Haldeman Ave., Phila. 15, Pa.
Please have your local representative call for an appointment.

Company _____ Title _____
Name _____ City _____ State _____
Street _____
In Canada write: The Yale & Towne Mfg. Co., Box 337—Postal Station "A"—Toronto

YALE*

MATERIALS HANDLING EQUIPMENT

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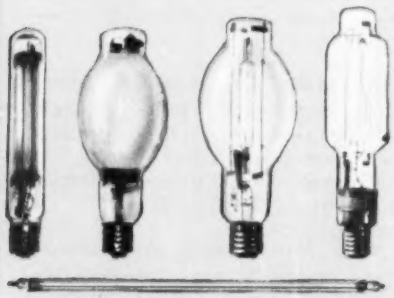
Gas and Electric Industrial Trucks • Worksavers • Hand Trucks • Hand and Electric Hoists • Pul-Lifts

EMPLOYEES SAY,

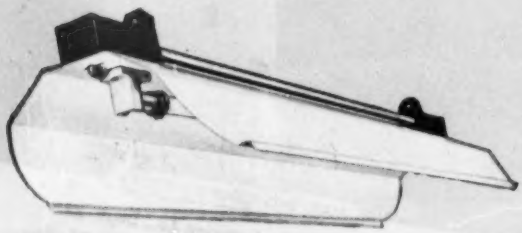
1000-watt mercury high-bay luminaire 25 ft. and over

400-watt millite luminaire
16 ft. and over

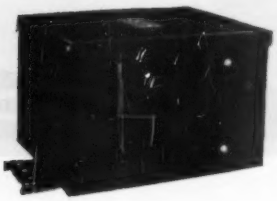
400-watt mercury luminaire
16 ft. and over



Complete range of lamps, including the new color-corrected J-H1 400-watt lamp.



3000-watt mercury luminaire
40 ft. and over



Complete range of ballasts for high or low-voltage distribution systems.

"Better than daylight"

with Westinghouse MERCURY lighting

"We get over 50 footcandles evenly distributed in this work area—and have completely eliminated the need for auxiliary lighting," says Chief Electrician of an Ohio plant about their new main high-bay-assembly area.

What's more, he further states that the employees report, "It's even better than working in daylight . . . there are no shadows or glare." A Westinghouse combination mercury-incandescent system takes credit for these results.

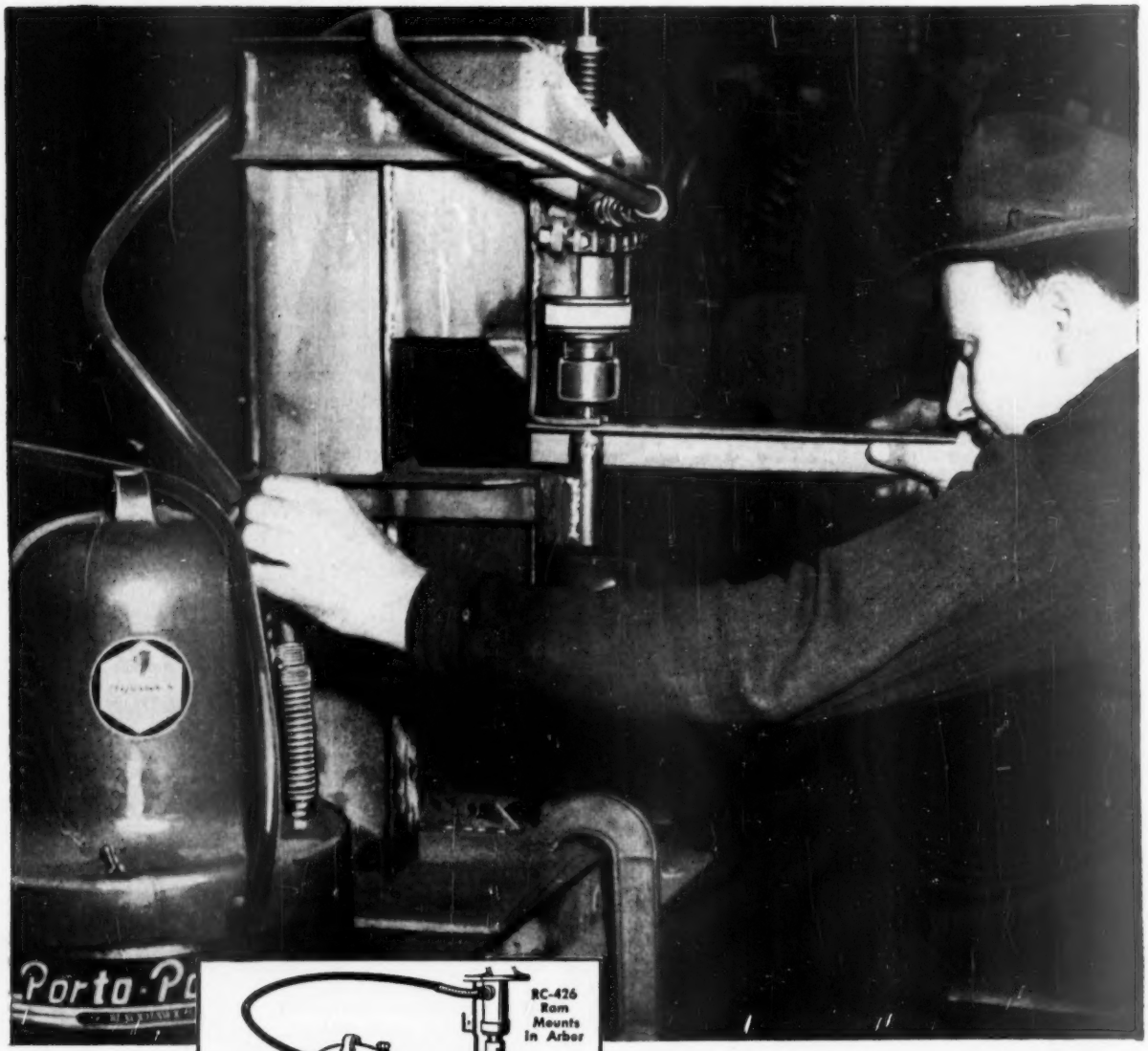
He concluded, "We have always believed that high-quality illumination pays for itself in more and better work, fewer errors . . . and this installation, made according to a plan, proves that it does just that." Only Westinghouse can offer you the complete mercury system—luminaires, lamps, and ballasts.

It will be well *worth your while* to investigate Westinghouse, where you can review all sources and all types before selecting one system. Get B-4727, "Lighting at Work" in every industrial area. Call your nearest Westinghouse Office or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-04298

YOU CAN BE SURE... IF IT'S
Westinghouse

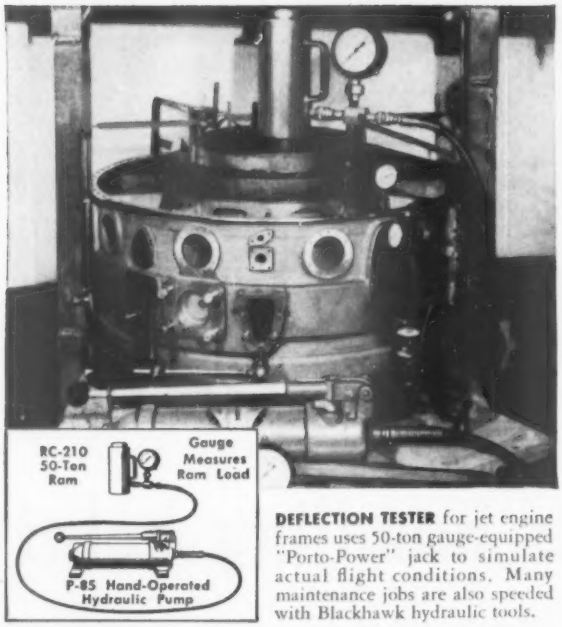
LIGHTING DIVISION
Edgewater Park, Cleveland

With IDEAS like these and hand tools


Porta-Po
RC-426 Ram Mounts In Arbor
P182 Porto-Power Hydraulic Pump includes AC or DC Motor, Valves, Oil Reservoir
Hose Transmits Oil under pressure
To Electrical Outlet

THIS SHOP-BUILT PUNCH PRESS was made with inexpensive, standard "Porto-Power" hydraulic components to meet a special production problem. The 10-ton hollow push-pull ram, with its power-driven pump, pierces 12 holes per minute in ½ in. angle iron.

.... hydraulic tools multiply manpower!



DEFLECTION TESTER for jet engine frames uses 50-ton gauge-equipped "Porto-Power" jack to simulate actual flight conditions. Many maintenance jobs are also speeded with Blackhawk hydraulic tools.

UNIFORM STUD TIGHTENING is assured with "Tork-flash" tension wrench. No guesswork on this assembly line! Other hand tools in broadened Blackhawk line offer similar gains in time, accuracy.

And IDEA BOOK shows you 1001 short-cuts that save time, money, materials

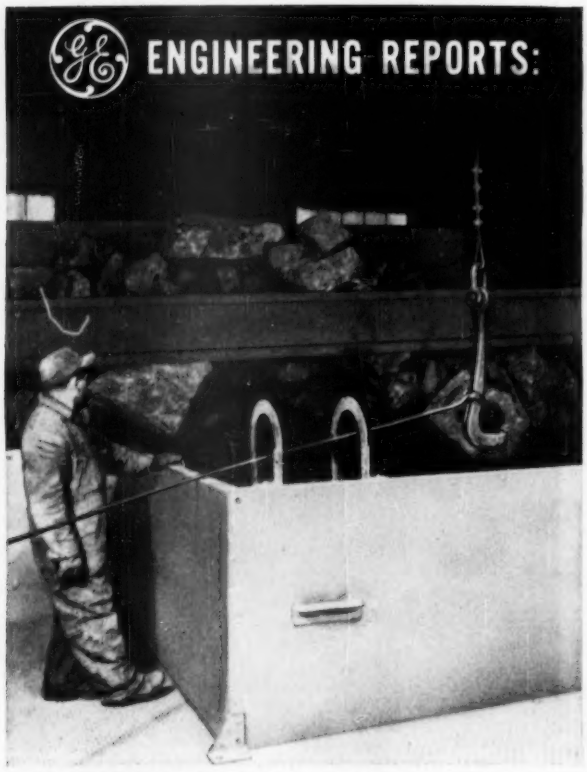
Yes, many industrial and construction methods today are being revolutionized by Blackhawk Hydraulic Tools and Hand Tools. Throughout maintenance and production — on such varied jobs as testing and field service . . . welding and inspection — savings in time, money and materials are often spectacular.

Safety and ease are introduced to many tasks formerly downright dangerous and back-breaking. You'll find 64 pages of these valuable ideas in the great Blackhawk IDEA BOOK. So — get your free copy from "The Man Who Knows," your industrial supply salesman. If your distributor cannot supply you with an IDEA BOOK, write on your company letterhead to Blackhawk Mfg. Co., Dept. M2713, Milwaukee 1, Wisconsin.

HEADQUARTERS FOR THE WORLD'S MOST COMPLETE LINE OF HYDRAULIC TOOLS ... plus INDUSTRIAL HAND TOOLS

BLACKHAWK®

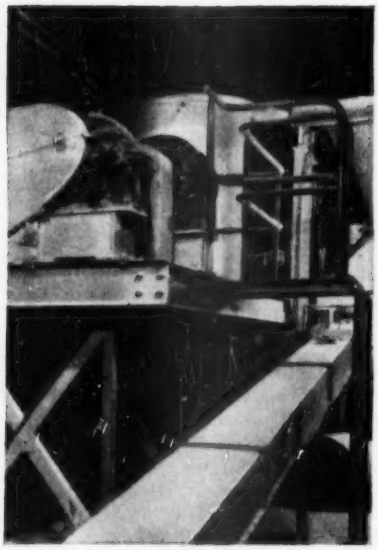
Visit our Booths 426-428-430 at the PLANT MAINTENANCE SHOW, Cleveland, Jan. 19-22



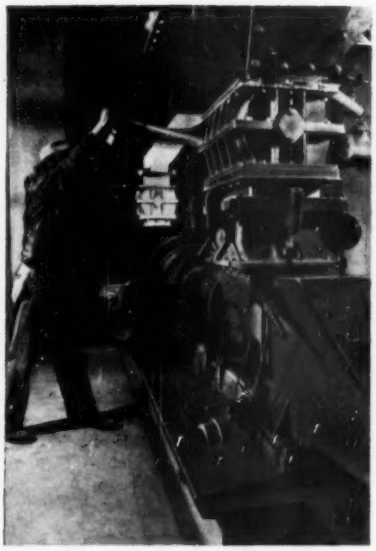
1 LIMESTONE IS DELIVERED in cars from quarry to primary crusher and hammermill. G-E powered crane is used by operator to keep rock from jamming in crusher.

2 CRUSHED ROCK IS CARRIED to storage by a 30-inch, 1200-foot-long conveyor. This sturdy G-E 60-hp motor starts the fully loaded belt without difficulty.

Modern materials handling helps



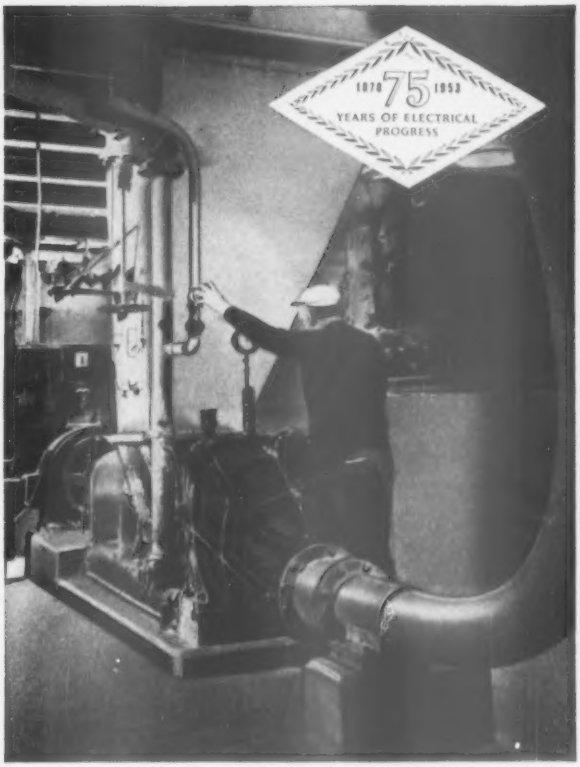
5 PULVERIZED STONE is fed to kilns by screw conveyors (on platform) with G-E selsyn drives which co-ordinate screw speed and kiln rotation.



6 FINISHED CEMENT is pumped to packhouse by portable Fuller-Kinyon pumps. G-E 200-hp drives enable each to deliver 600 barrels per hour.

7 CONVEYOR DELIVERS filled bags to dock for loading into cars. Compact G-E gear-motor transmits maximum torque, provides uniform speed.

3 **ROUGH BLENDING** is done in storage by two G-E powered heavy-duty d-c cranes which dump selected rock into hoppers for delivery to the raw-grinding mills.



4 **FROM GRINDING MILLS,** pulverized stone is conveyed through a 10-inch pipe to blending bins. Fuller-Kinyon pump, G-E powered, pumps 120 tons per hour.

Universal Atlas reach peak output

G-E equipped system at Hudson, N. Y. cement plant keeps operation continuous from quarry to pack-house

Every continuous-process industry has the same materials-handling problem that Universal Atlas Cement Co. faced at their Hudson, N. Y. plant: *to minimize interruptions in the flow of materials being processed.*

Here's how Universal Atlas achieved this goal: Their engineers designed a materials-handling system made up of the most up-to-date equipment available. Plans included standby equipment and materials stockpiles at strategic locations to provide for necessary equipment maintenance. Then, reliable, long-life G-E drives were used for the entire system. The success of this carefully planned program is evident today when record production flows smoothly through the plant.

A modern materials-handling system integrated with production operations can eliminate bottlenecks and increase production in your plant. To help you achieve these goals, G-E application engineers are ready to work with you and your equipment manufacturer to solve electrical problems involved. Contact your nearest G-E Apparatus Sales Office today.

Most efficient way to modernize shown in new PROGRESSIVE MECHANIZATION program

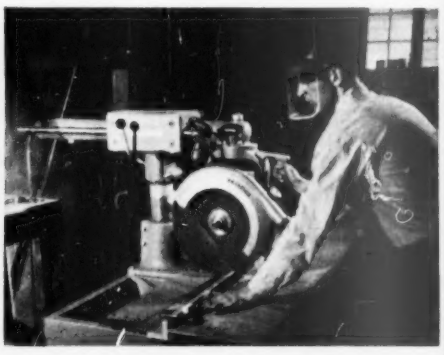
To help you set up a step-by-step plan for bringing plant operations to peak efficiency, G.E. has developed the new Progressive Mechanization Program. Ask your G-E apparatus representative for details, or write to General Electric Company, Sect. 669-5, Schenectady 5, N. Y.

Engineered Electrical Systems for Materials Handling

Conveyor drives • Hoist drives • Industrial truck drives and battery chargers

GENERAL ELECTRIC

John Huber uses the SKIL Pneumatic Drill, Model 1013, to drill rivet holes in a door assembly. There are now 32 models in the SKIL line of air tools. Unequalled for compactness, low maintenance, durability.



Charles Hupe cuts steel tubing with the SKIL Radial Saw, Model 450. He says, "We also speed work and insure accurate cutting by using this great tool to saw aluminum extrusions, plus wood and trim parts."

"We standardized on SKIL Drills for low maintenance, local factory service,"

—says **Roy Berger,** factory manager,
CASTLE INDUSTRIES, INC., Paine Field, Everett, Washington

Ernest Brevik uses SKIL Drill Model 47 with floating drill guide in assembly work. He says, "Compact size of this SKIL Drill makes jobs like this possible. They have more power for their size than any drill I've used."

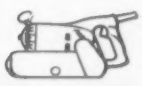
"We use 25 Model 47 SKIL Drills constantly in our sub-assembly of aircraft parts and manufacturing of precision stainless steel and aluminum products," says Mr. Berger. "We give portable tools long, tough use, and *must* have parts and repair service available. The local SKIL Factory Branch Office is the answer. However," he continues, "due to SKIL quality, maintenance has been very low, performance has been the best! SKIL Drills are first-rate—light-weight and compact, ideal for aircraft production."

CALL YOUR DISTRIBUTOR FOR COMPLETE INFORMATION OR CALL YOUR NEAREST SKIL FACTORY BRANCH

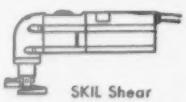
SKIL PORTABLE TOOLS

SKIL Products are made only by SKIL Corporation
formerly SKILSAW, Inc.
5033 Elston Avenue, Chicago 30, Illinois

Skil Factory Branches in Principal Cities.
In Canada: Skiltools, Ltd., 3601 Dundas Street West, Toronto 9, Ontario


SKIL Belt Sander

SKIL Driver


SKIL Shear

today's best buy is better air!

Type N ROTO-CLONES exhausting grinding and buffing operations.

ROTO-CLONES
control grinding and buffing dust!

The four Type N ROTO-CLONES* shown above are only a part of the total number installed in this large automotive parts manufacturing plant to control the difficult dust problem created by grinding and buffing operations.

The Type N ROTO-CLONE is a dynamic precipitator of the hydro-static type. It exhausts, collects and stores dust... in the form of sludge... within one compact, self-contained unit. High efficiency dust and fume removal is obtained by the Type N's dual washing and scrubbing action. This removes both coarse material and extreme fines from the air stream, even in excessive concentrations. Water curtains induced by air flow eliminate pumps, nozzles and all moving parts.

The Type N ROTO-CLONE maintains peak efficiency without interruptions for reconditioning or service. Also uniform air delivery assures sufficient air flow at hoods and unvarying velocities in branch pipes and main ducts at all times.

The complete line of AAF ROTO-CLONES offers a wide selection of performance and operating characteristics that will efficiently control every dust source. For the correct solution to your dust or air pollution problem call your nearby AAF representative or write direct to us.

**ROTO-CLONE is the trade-mark (Reg. U.S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.*

AAF **American Air Filter**
COMPANY, INC.

361 Central Avenue, Louisville 8, Ky. • American Air Filter of Canada, Ltd., Montreal, P. Q.

13.75 YEARS "AT HARD LABOR"

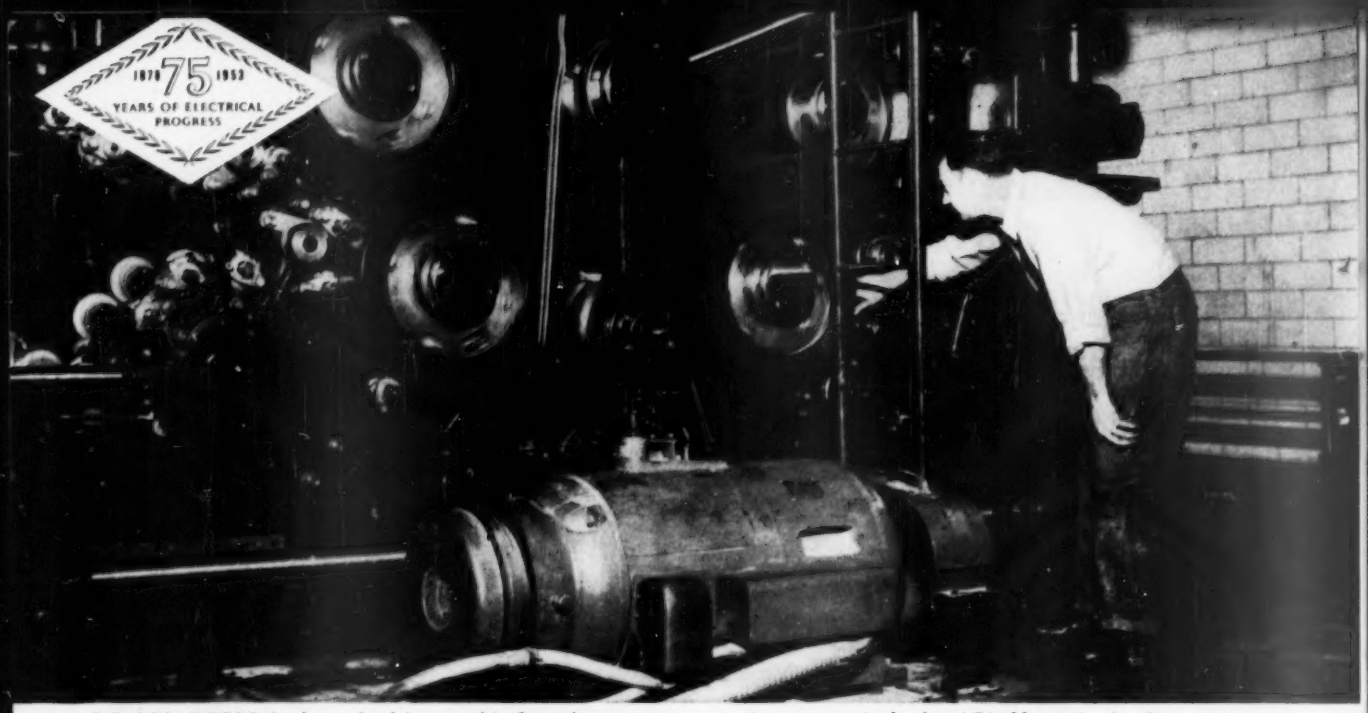
Records of the operation of a fleet of electric industrial trucks in an eastern plant of a large manufacturer of domestic heating equipment show that all cells of all EDISON storage batteries replaced during the past five years gave an average service life of 13.75 years.

The EDISON batteries have never failed to furnish ample power for continuous, full-shift truck operation. And the trucks are hard workers. They regularly handle loads of sheet steel and fabricated metal parts averaging close to their full rated capacities. On occasion, the batteries have operated the trucks for 10 hours without being exchanged—an indication of their ample reserve of operating power *through the very end* of the shift.

Such outstanding performance is not unusual. It's the kind of performance that may be expected from EDISON batteries anywhere under similar conditions of application, operation and maintenance. Get the facts about what they can do on *your* job. It will pay you to send for Bulletins S. B. 3808 and S. B. 2039 and the address of your nearest Edison field engineer.

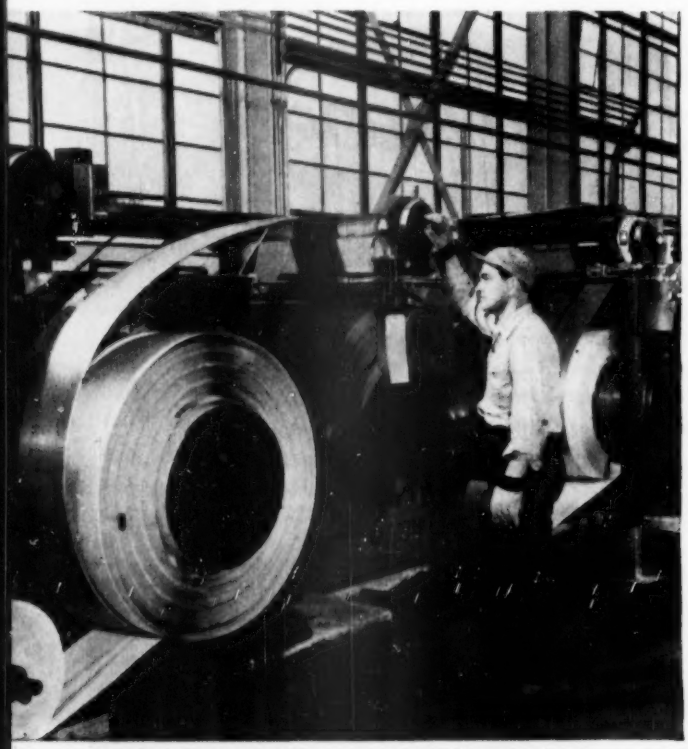
Most Dependable Power . . . Lowest Over-all Cost
***. . . you get <u>both</u> with an* EDISON**

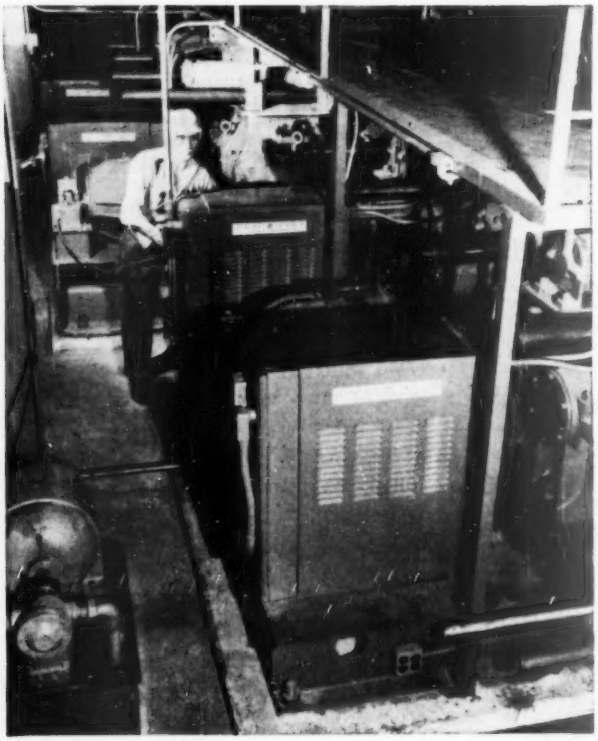
EDISON
Nickel • Iron • Alkaline
STORAGE BATTERIES
Edison Storage Battery Division of
Thomas A. Edison Incorporated, West Orange, N. J.



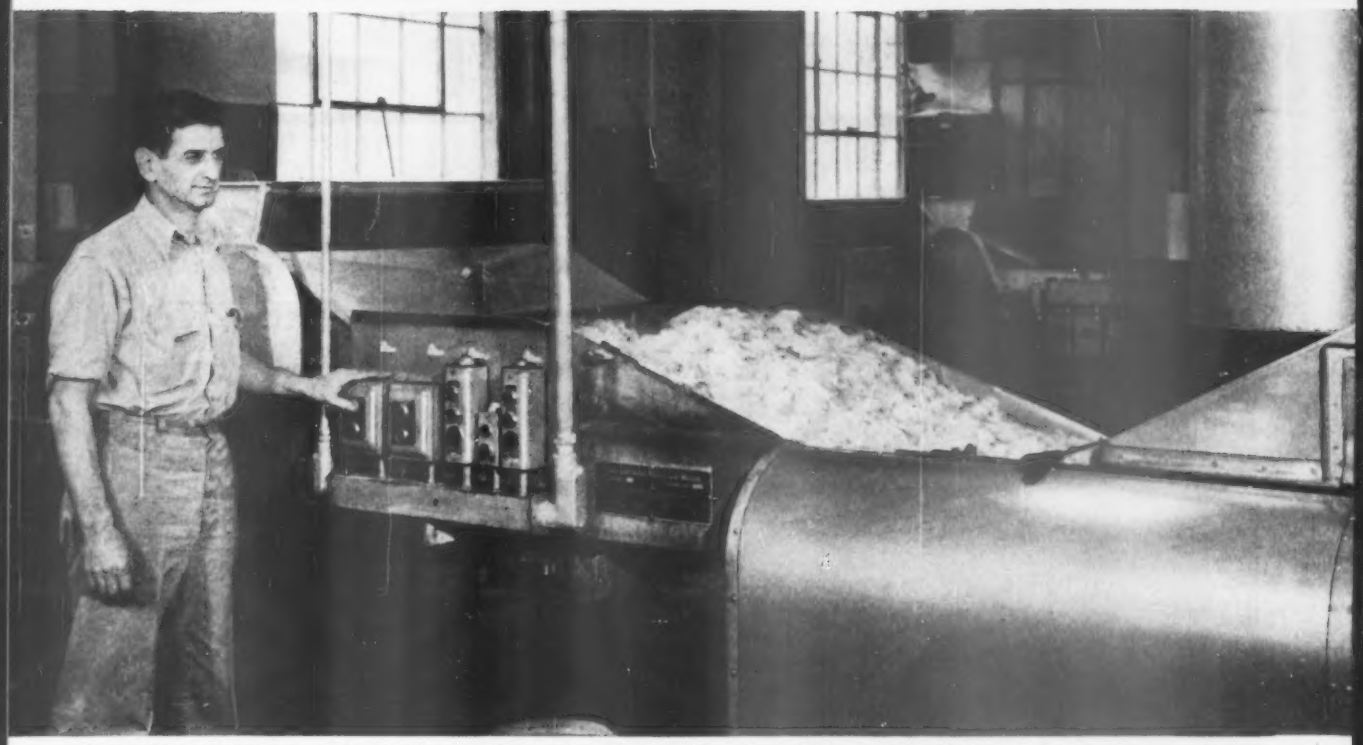
G-E ACA MOTOR is the main drive on this five-color press at Alford Cartons, manufacturers of folding boxes, Ridgefield Park, New Jersey. Working from AC current with no conversion equipment required, the ACA Motor is the low cost way to Adjustable-speed Drive performance. You get stepless speed adjustment within a speed range of from 3 to 1, 6 to 1, and 20 to 1.

Make your machinery more versatile





G-E SPEED VARIATOR boosts winders "spooling" chrome strip steel at Wallingford Steel Co., Wallingford, Conn.—handles all speeds from 5 to 80 feet per minute. G-E Speed Variators, with speed ranges up to 40 to 1, are complete "package" units—available in ratings from 1 to 200 hp. For even greater accuracy and versatility, these drives may include amplidyne or electronic regulators.



G-E THY-MO-TROL* DRIVE at the El-Ge Potato Chip Co., York, Pa., electronically regulates potato chip processing where accurate speed control is extremely important to the finished product. Thy-mo-trol drive is available between 1/40 and 75 hp, offers smooth speed adjustment ranging up to 100 to 1 and can be made to hold regulation as close as ±½% regardless of changes in voltage.

with a G-E Adjustable-speed Drive!

G-E ADJUSTABLE-SPEED DRIVES offer you the chance to get the most from your machinery investment. You can step up production, minimize material waste, improve product quality, and enjoy the ability to produce a greater variety of goods.

THERE IS A G-E ADJUSTABLE-SPEED DRIVE FOR YOU. Whether you need speed regulation within ±½% or ±10% you can get an economical Adjustable-speed Drive from the full G-E line. From the G-E ACA motor which requires but a simple twist of a dial . . . to the G-E Thy-mo-trol drive which permits precise electronically controlled drive speeds . . . General Electric manufactures a drive that will enable you to produce better and more uniform products. Packaged drives are available in sizes from 1/40 to 200 hp. Depending on hp, speed ranges are available from 3 to 1 up to 100 to 1.

FOR FULL INFORMATION consult your nearest General Electric Apparatus Sales Office. Your G-E Sales Representative will be glad to recommend the most economical drive best suited to your operation. For printed information on the complete line of Adjustable-speed Drives, use the coupon.

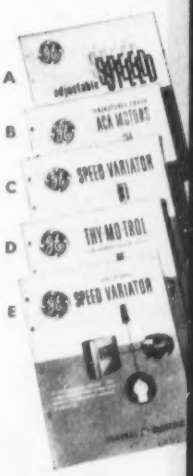
*Reg. Trademark of General Electric Company

You can put your confidence in—

GENERAL ELECTRIC

LET G.E. HELP YOU PICK THE RIGHT DRIVE

Because only General Electric makes **all major types** of electric adjustable-speed drives, it is best qualified to help you select the **right drive.** Send for these informative bulletins.



☐ **A.** This 26-page manual describes **all** four types of drives and where to apply them. Bulletin GEA-5334.

☐ **B.** Lower cost, simplest a-c drive. Bulletin GEA-4883.

☐ **C.** More flexibility, moderate cost. Bulletin GEA-5335.

☐ **D.** Top performance, 1/70—75 hp. Bulletin GEA-5337.

☐ **E.** Top performance, 1–200 hp. Bulletin GEA-5336.

General Electric Company
Section B646-20
Schenectady 5, N. Y.

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☐ for reference only
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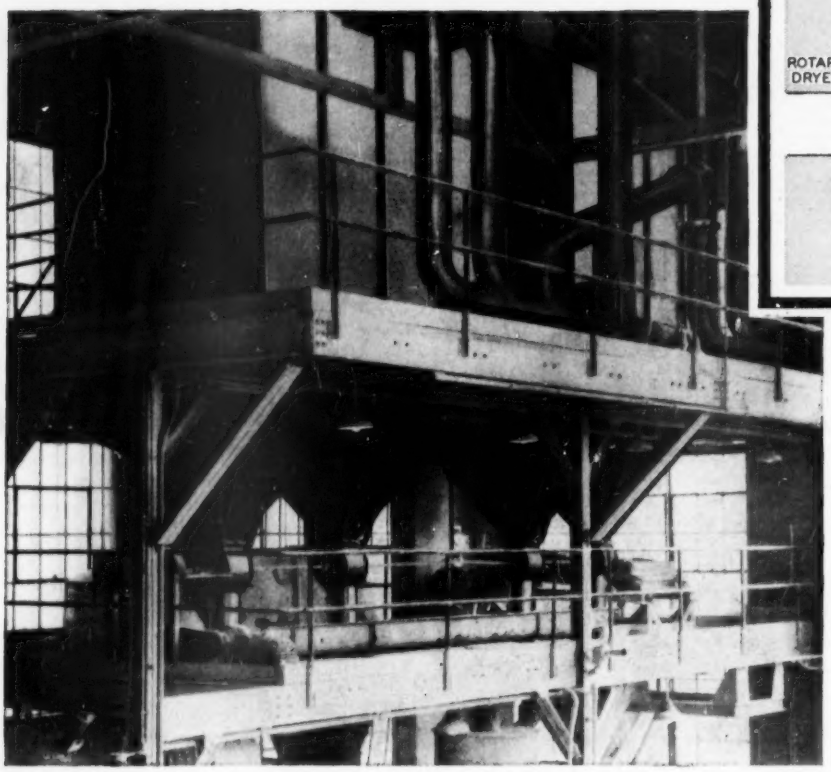
HERE'S WHAT WE MEAN—

ABOUT DRACCO "KNOW HOW!"



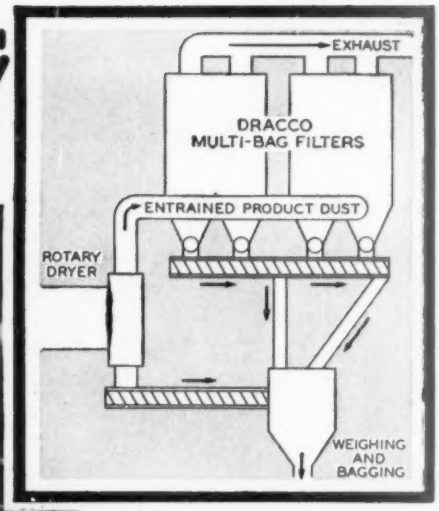


Diagram illustrates how Dracco units prevent costly loss of product in exhaust and move all product to weighing and packaging.

Air blast through rotary drier entrains product chemicals which are captured and recovered by Dracco Filters.

"Know-how"—at Dracco—is more than a "catch phrase"—it's the result of many years' experience in solving all types of dust control problems.

The importance of Dracco "know-how" to users of Dust Control Equipment is demonstrated by this case of a producer of organic chemicals.

This company employs a manufacturing process requiring the recovery of product dust from a drying operation. Former equipment was unsatisfactory in operation.

Dracco engineers were called in to solve the problem. They conducted a thorough engineering survey which resulted in a custom-engineered installation of Dracco equipment *exactly* fitted to this customer's needs. Dracco units proved successful immediately, and have since provided trouble-free, essentially 100% product recovery.

If you have a *tough* dust control problem, you can rely on Dracco "know-how" to produce a profitable, "Performance-Proved" solution. It will pay you to get it done right the first time—by Dracco.

Call or write in for a Dracco Engineer—there is no obligation.

DRACCO CORPORATION

Harvard Ave. and E. 116th St. • Cleveland 5, Ohio

Write for Bulletin 529 and the Dracco Engineering Data Sheet which will simplify an analysis of your dust problem. Address Dept. F-1, Cleveland 5, O.

DRACCO

Performance Proved

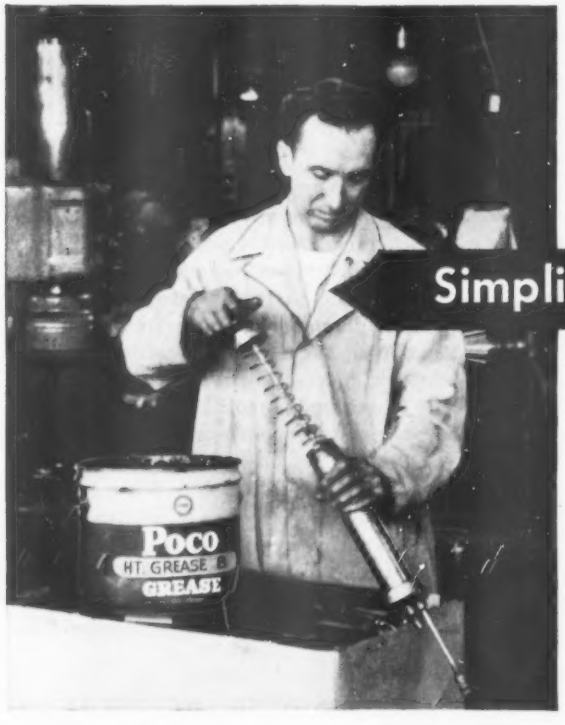
Airstream **CONVEYORS • DUST CONTROL EQUIPMENT**

HUNDREDS OF MACHINES—BUT ONLY ONE GREASE!

Read how another manufacturer simplifies and saves with

PURE OIL INDUSTRIAL LUBRICANTS

BE SURE PURE WITH PURE



A large midwestern metal-working plant produces chrome-plated trim (hub caps, grills, etc.) for the automotive industry. All types of metal-working equipment —400-ton presses, shears, drills, lathes, roller-levelers and grinders—are used as well as huge chrome-plating machines. Yet *only one grease*—Pure Oil's POCO HT GREASE B—and one dispenser is used for *all* applications! And in 3 years there has been no down time due to lubrication failures.

Simplify and Save

Here at Pure Oil we specialize in industrial oils and greases designed to do several *different* jobs—instead of one specific job.

And to do each job equally well.

For this reason, our technical experts can nearly always help you to reduce your lubricants inventory . . . simplify your lubricating procedure . . . minimize waste and error.

One of our technical experts will be glad to give you full details, right away. Just call your local Pure Oil office* or write:

THE PURE OIL COMPANY Industrial Sales
35 E. Wacker Drive, Chicago 1, Illinois

Be *sure* with Pure

***Sales offices in more than 500 cities, including:** Atlanta, Georgia • Birmingham, Alabama • Charlotte, North Carolina • Chattanooga, Tennessee • Columbus, Ohio • Hattiesburg, Mississippi • Indianapolis, Indiana • Jacksonville, Florida • Madison, Wisconsin • Memphis, Tennessee • Miami, Florida • Minneapolis, Minnesota • New York, New York • Norfolk, Virginia • Parkersburg, West Virginia • Pensacola, Florida • Seaford, Delaware

Don't Bargain-Shop for Service . . .

A part that doesn't fit or function right is poor tonic for your electrical apparatus. That's why Replacement parts can become expensive headaches. They may *replace,* temporarily . . . but they won't *renew* your equipment. Good service economy, rather, calls for a Renewal Part—precision engineered, and designed specifically for the original apparatus.

That's why Westinghouse backs *all* new equipment with a full line of Genuine Renewal Parts. They are precision built—on the same machines that turn out parts for original apparatus. They contain the latest materials and improvements, developed by a multi-million dollar Westinghouse research program. You benefit by getting a *better* part—often better than the one designed for the original equipment.

Westinghouse stocks parts in 31 Renewal Parts Warehouses over the country. This network speeds deliveries . . . helps you with inventory control . . . makes it easy for you to carry frequently used parts.

Renewal Parts, however, is only one phase of the complete Maintenance Service offered by Westinghouse. It also maintains 36 Repair Plants, where all kinds of electrical apparatus is repaired . . . and 46 Field Service Offices to make inspections, adjustments and on-the-spot repairs for equip-

CALL WESTINGHOUSE FOR A COMPLETE MAINTENANCE SERVICE

There's a difference between replacement and renewal parts!

ment that cannot be moved easily.

These services are backed by factory-tested methods, factory-approved materials, factory-trained specialists. They provide the finest in *service protection* . . . the best in *service economy.* Your proof is in the performance of the finished job.

For more information, write today for a free copy of Westinghouse Maintenance booklet, B-4766. It's loaded with facts and illustrations covering the complete Westinghouse Maintenance Service. Send your request to: Maintenance Sales Dept., Westinghouse Electric Corp., East Pittsburgh, Pennsylvania. J-95157

...MATCHED TO YOUR NEEDS

YOU CAN BE **SURE**...IF IT'S

Westinghouse

COMPLETE MAINTENANCE SERVICE

SHOP REPAIR FIELD SERVICE

GENUINE RENEWAL PARTS

Since the introduction of fluorescent lighting...

greatest STEP UPWARD in industrial SEEING COMFORT

...new BENJAMIN "Task Master"

Shatters precedent with a completely new concept of lighting unit design!

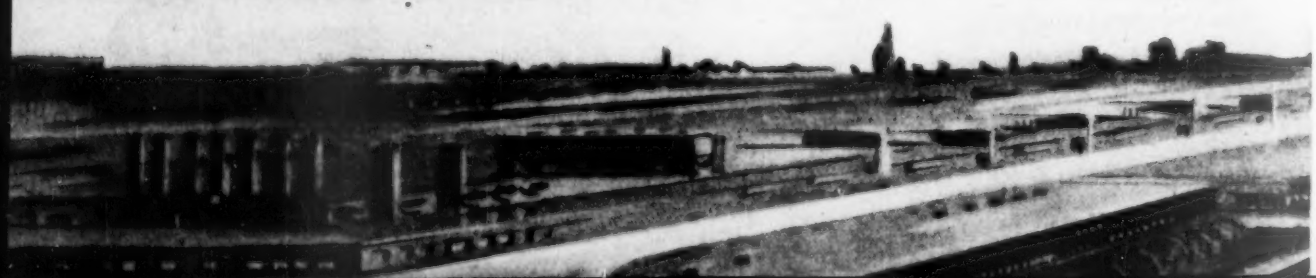
Masters the brightness ratio problem by directing approx. ¼ of light upward!

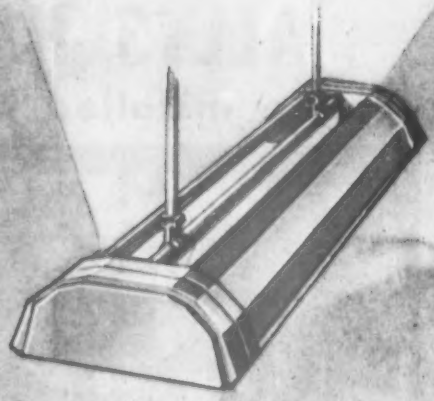
Doubles... even triples... present standards for industrial seeing comfort!

Introduces new methods of installation and maintenance!

Yes, the new Benjamin "Task Master" is the greatest step UPWARD in industrial fluorescent lighting history. It's a step UPWARD to high lighting levels without the discomfort which can often accompany them... a step UPWARD to complete freedom from annoying ceiling contrast that may cause excessive brightness ratios. It's a step UPWARD to greater seeing comfort in America's work places! Moreover—"Task Master" represents a great step UPWARD in high-speed installation and trouble-free maintenance, as shown above. Get full details about this greatest step UPWARD in industrial seeing comfort... send for FREE "TASK MASTER" Data Bulletin, containing complete specifications. Write:

Benjamin Electric Mfg. Co., Dept. N, Des Plaines, Ill.





3 ways to mount: chain, conduit and sliding hanger suspension (illustrated).

UPWARD ILLUMINATION COMPONENT directs approximately ¼ of light towards the ceiling. In addition to providing more generous **UPWARD** flow of light, this unique construction reduces maintenance expense as it practically eliminates horizontal areas where dust and dirt can collect.

DETACHABLE REFLECTORS are hinged to facilitate easier, more thorough cleaning right on the fixture; or they may be quickly unhinged and replaced with reflectors which were previously cleaned at a bench. 2 simple spring-type clips lock or release each reflector . . . no tools needed.

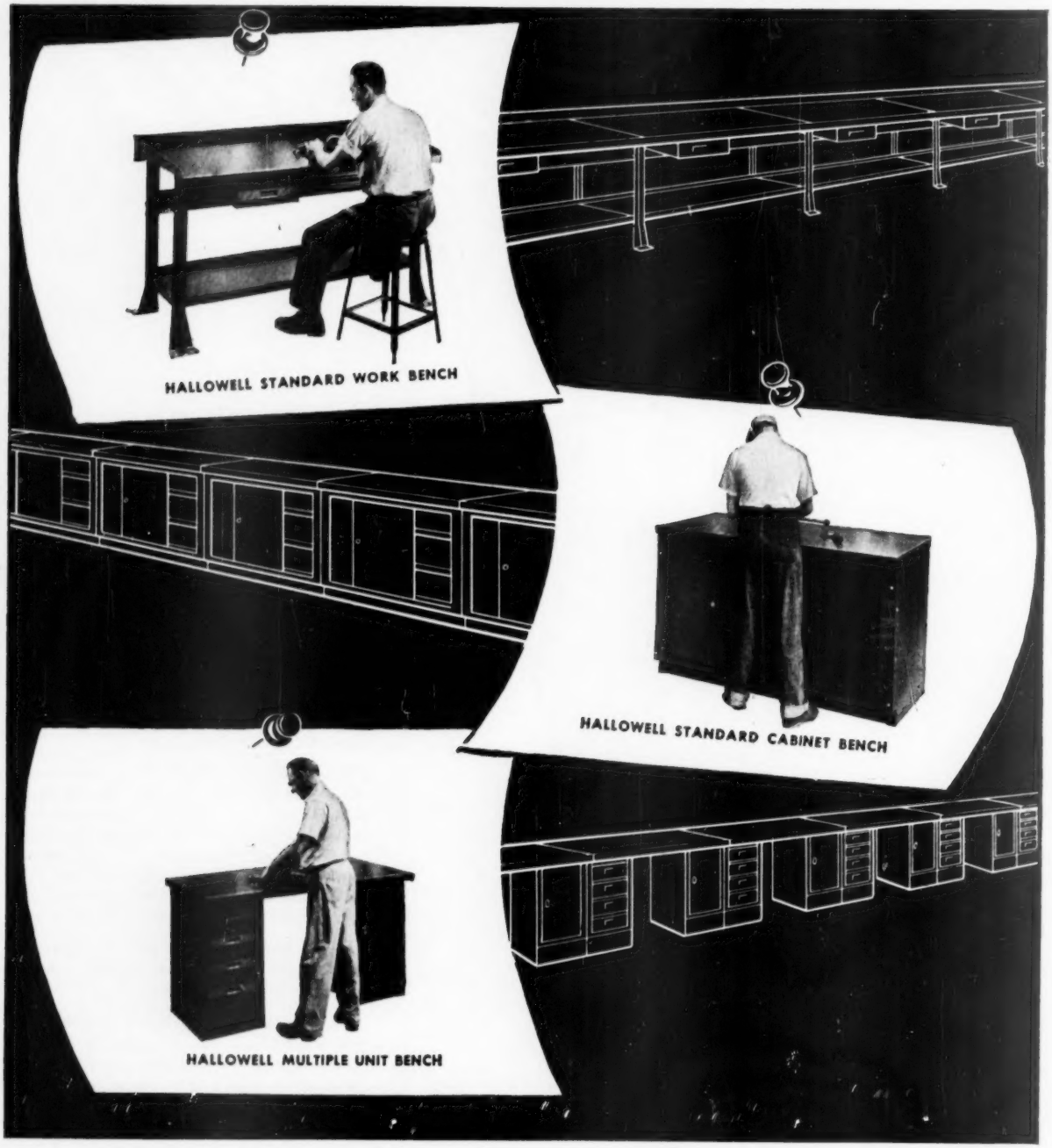
PRE-WIRED . . NO WIRE SPLICING . . All Connections made to Terminal block. No need to run line wire through fixture. Furnished with branch circuit wiring already run through a combination spine support and lamp shield. (Shielding angle is 35°) Just connect line wires to terminals (see picture A above). For continuous line installations, simply connect "jumper" wires to opposite terminal blocks (see picture B).

BALLAST AND TERMINAL BLOCK are strategically located in easily-accessible end sections . . . out of the way for more streamlined appearance.

Of course, **EXCLUSIVE BENJAMIN "SPRINGLOX" LAMPHOLDERS** are standard equipment. They are acknowledged as embodying the most advanced lampholder features. Such as: rugged, all-metal construction and unique, patented spring design for "quick-in, quick-out" lamp maintenance.

ALL 3 HALLOWELL BENCHES

can be installed individually or in continuous line



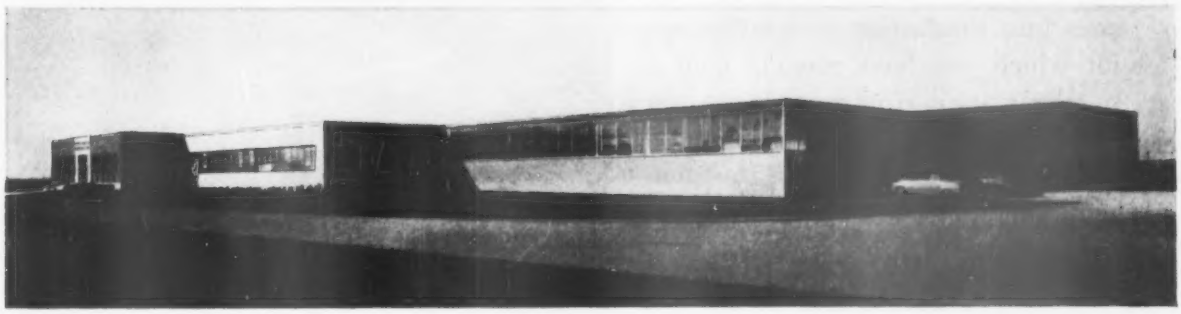
Standard, interchangeable HALLOWELL Benches can be used individually as required. But, unlike with ordinary benches, multiple units can be quickly and easily assembled to make a continuous bench of any desired length. Write today for literature. STANDARD PRESSED STEEL CO., Jenkintown 11, Pennsylvania.

HALLOWELL SHOP EQUIPMENT DIVISION

SPS
JENKINTOWN PENNSYLVANIA

GOULD OPENS 21ST PLANT

TO MEET INDUSTRIAL BATTERY DEMAND



Front and side views of Gould's new Kankakee, Ill., plant

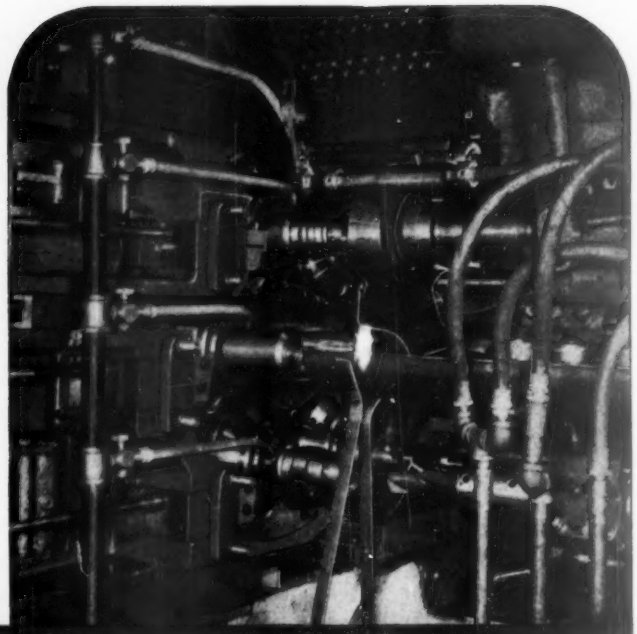
GOULD'S NEW KANKAKEE PLANT which went into production on November 10 is the 21st Gould plant in the United States and Canada. Devoted entirely to the manufacture of storage batteries for industry, it gives Gould the additional capacity necessary to meet the increased demand for Gould batteries in all parts of the country. Thanks to these new facilities, Gould customers can expect even faster service than before.

GOULD *Industrial Batteries*

GOULD-NATIONAL BATTERIES, INC., TRENTON 7, N. J.

Always Use Gould-National Automobile and Truck Batteries

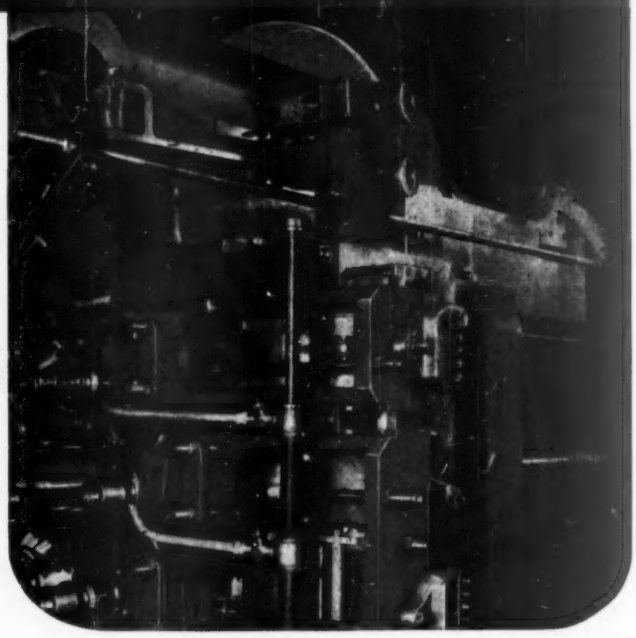
The main end slide of a 3½-SIX figures prominently in producing the above piece. Its total length is 34½ ins. Its diameter is 12 ins. Its swing for die heads, etc., is 4 ins. The maximum recommended load for the slide is 12,000 foot pounds. Its bearing area is approx. 258 sq. ins.



Front Side of Tooling Area

BETTER BEFORE THAN AFTER

Rear Side of Tooling Area

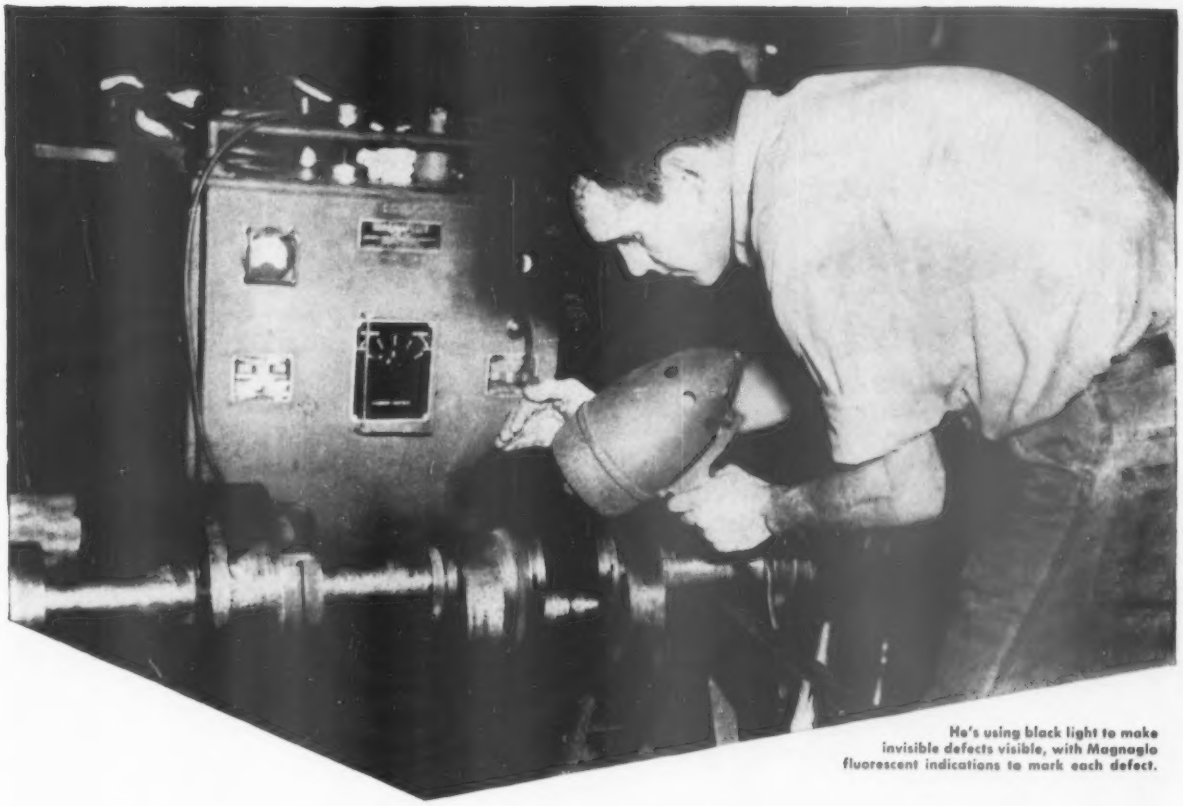


What an "automatic" does *after* it goes into production is information for which you have already paid a purchase price. How much more you will pay for operation and maintenance costs will determine the completeness and dependability of that information.

It is always better to have complete and dependable information *before* the purchase than after. You can have it on CONOMATICS.

A Comparison of ALL Automatics is in favor of Cone

Conomatic} CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.



He's using black light to make invisible defects visible, with Magnaglo fluorescent indications to mark each defect.

He's Looking for Dollars—
and finding them!

HE'S finding dollars that are wasted when a machine breaks down . . . when its production stops . . . when AVOIDABLE EMERGENCY REPAIRS shoot costs sky-high.

His job is finding cracks and defects that are the cause of much equipment breakdown and many serious accidents. Because of his work, machines can be kept on the production line without costly interruption. He uses Magnaflux' equipment and methods.

Maintenance inspection with Magnaflux' Methods substitutes low cost prevention and correction for high cost repair and rebuilding. It is saving *important* money for countless cost-minded companies. They now consider it as essential as any routine lubrication.

One or another of Magnaflux' many inspection methods can reduce your operating cost through effective, PREVENTIVE maintenance. A Magnaflux engineer is ready to help you.

Meanwhile, mail the coupon for your copy of the new free bulletin, "Good Maintenance is Prevention—Not Repair."

Magnaflux' Inspection Methods
detect the growing failure points in machines and equipment, *before failure occurs*

MAGNAFLUX CORPORATION
Reg. U. S. Pat. Office

MAGNAFLUX

DETECTS DEFECTS

MAGNAFLUX CORPORATION
5944 Northwest Highway, Chicago 31, Illinois
New York 36 • Cleveland 15 • Detroit 11 • Dallas 9 • Los Angeles 58
Export Distributor: Curtiss Wright Corp.
In Canada: Williams & Wilson, Ltd.

MAGNAFLUX CORPORATION
5944 Northwest Highway, Chicago 31, Illinois

Please send me at no cost, a copy of your new bulletin, "Good Maintenance is Prevention—Not Repair."

Name_____

Title_____

Company_____

Address_____

City_____ Zone____

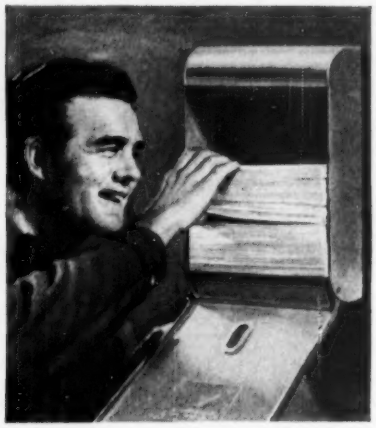
State_____

ScotTissue Towels save more because they do more

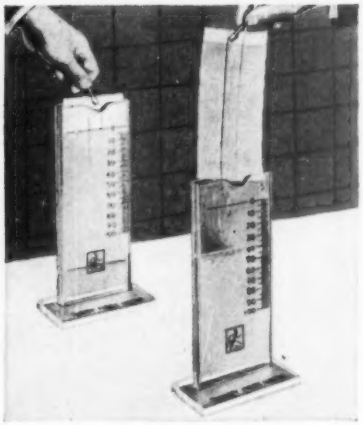
One towel dries both hands, saving time, towels, and maintenance

SAVE TIME!
Since one ScotTissue Towel dries both hands quickly, there are less washroom "traffic jams." Workers are able to get back to their jobs a lot faster.

SAVE TOWELS!
Employees appreciate famous ScotTissue Towels—they're softer and stronger than ever—compare them against any other paper towel or service. Fewer ScotTissue Towels used means all-around savings.



SAVE MAINTENANCE!
With fewer ScotTissue Towels used, less storage space, and less servicing of dispensers and receptacles is required—reducing janitor costs. That's why companies who "slide-rule" costs prefer them.



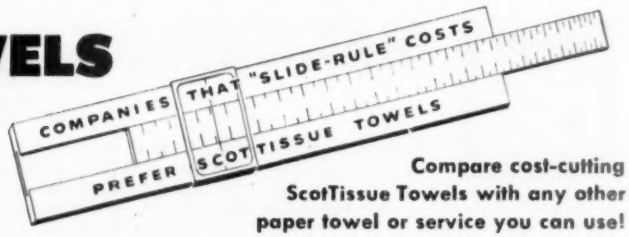
HERE'S PROOF!
In the "Thirsty Fibre" Meter Test, a ScotTissue Towel is immersed in water for 20 seconds. You see its quick absorption and great water retention—another reason why fewer are used per employee per year.

The right kind of washroom is one of the four most important essentials in good working conditions—according to a survey of employees from 400 plants.

Take advantage of our unique Washroom Advisory Service. We'd be glad to give you tested plans and specific suggestions for improving your washrooms. And if you would like a personal demonstration of cost-cutting ScotTissue Towels—the "Thirsty Fibre" Test—just write us on your company's letterhead. Address: Washroom Advisory Service, Scott Paper Company, Chester, Pa.

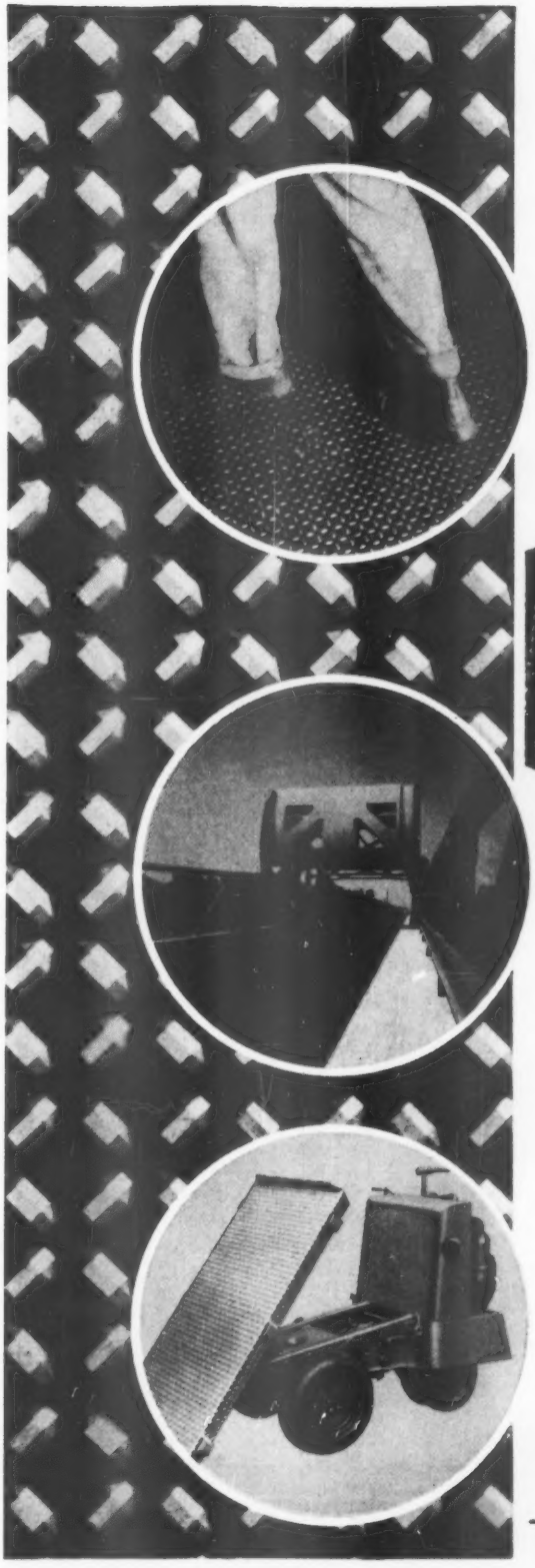
SCOTTISSUE TOWELS

Symbol of the right kind of washroom



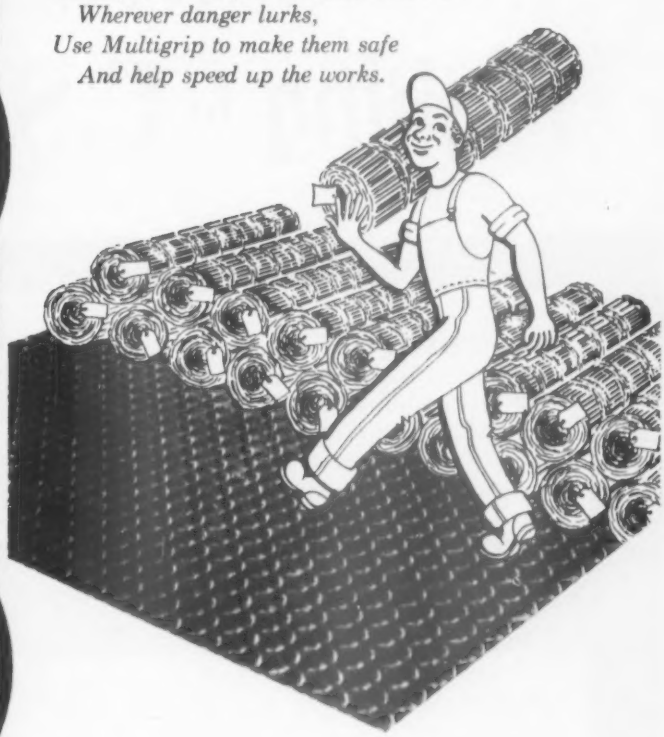
Compare cost-cutting ScotTissue Towels with any other paper towel or service you can use!

"ScotTissue," "Thirsty Fibre," "Washroom Advisory Service," Reg. U. S. Pat. Off.



Got to fill this order fast,
They need it in a hurry—
But, safe on non-skid Multigrip,
He can hurry without worry!

On steps, on ramps, and platforms too—
Wherever danger lurks,
Use Multigrip to make them safe
And help speed up the works.



For safety's sake use U·S·S Multigrip Floor Plate. Multigrip affords sure footing for your workers, positive traction for vehicles. It is durable, neat appearing, easy to keep looking like new. There are no pockets to hold dirt, grease and water. It drains freely, quickly. The flat-topped risers of Multigrip are comfortable underfoot too . . . help reduce fatigue, a major cause of accidents.

UNITED STATES STEEL CORPORATION, PITTSBURGH
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, CHICAGO
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S multigrip FLOOR PLATE

USS

Sold by leading distributors from coast to coast

2-1926

UNITED STATES STEEL

Safety and Cleanliness

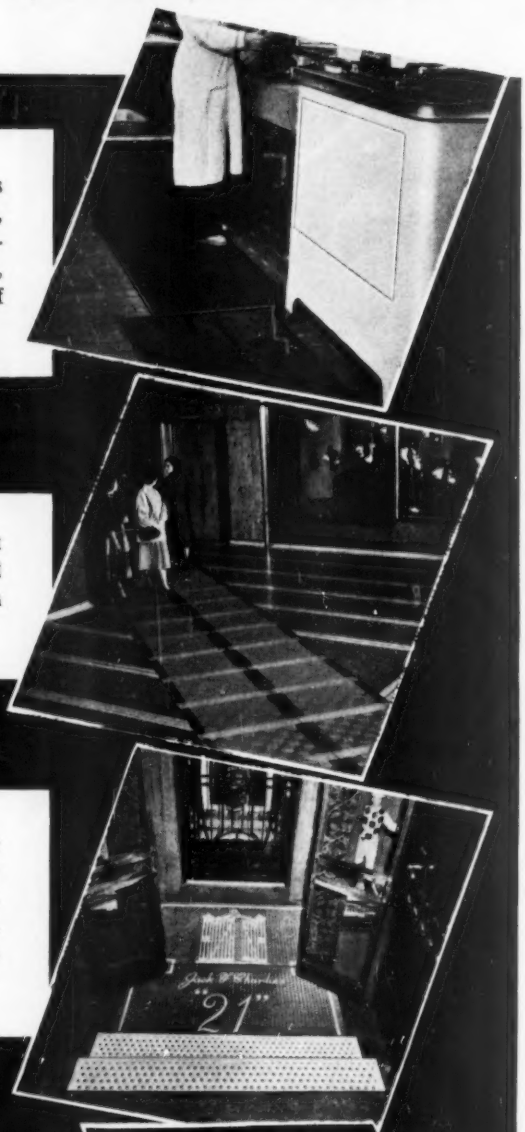
PLUS BEAUTY AND ADVERTISING VALUE!

Matting by U.S. RUBBER

FOR SAFETY: U.S. Matting is slip-proof, insulates against cold floors. Working conditions are healthier, too. It is available specifically designed for the particular job in hand, in every type of industry. For example, matting for the meat packing industry is made of neoprene to withstand fats and greases.

FOR CLEANLINESS: U.S. Mattings serve as foot scrapers, keeping dirt and moisture from being tracked through a building. Matting is quickly cleaned with a hose or damp cloth.

FOR IDENTIFICATION: Any insignia, lettering or advertising slogan or trade mark can be faithfully and colorfully reproduced and this means your identification will be seen as long as the mat is in use. Perforations permit dirt to drop through and it is easily swept up when mat is raised for cleaning.



For complete information write address below.

PRODUCTS OF

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Even with 8 Hands Could Sitatãpatrãparãjitã Have a Finger in So Many Pies?

● **Meet the goddess of Tibetan mythology—three-headed and eight-armed. Quite a versatile gal, according to ancient lore.**

Now Meet Mr. Lyon Dealer

He spots the goddess two heads and six arms and still matches her versatility. Here's why—

● Lyon Steel Equipment Dealers serve virtually every segment of business and industry—with a diversified line of products totalling more than 1500 standard Lyon items. (A few typical products are shown below.) Factories, shops, warehouses, offices, churches, clubs, hospitals, homes—Lyon Dealers serve them all.

Lyon engineering and production facilities are also available for special contract work.

FACTORIES IN... AURORA, ILL., AND YORK, PA.

LYON METAL PRODUCTS, INC.

General Offices: 112 Monroe Avenue, Aurora, Illinois

Sold Nationally Through Dealers and Branch Offices

LYON

STEEL EQUIPMENT

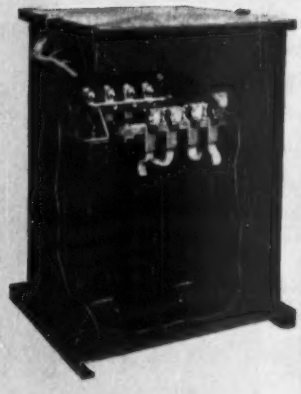
A PARTIAL LIST OF LYON STANDARD PRODUCTS

• Shelving	• Kitchen Cabinets	• Tool Toters	• Economy Locker Racks	• Display Equipment	• Filing Cabinets	• Service Carts	• Tool Stands
• Lockers	• Cabinet Benches	• Bar Racks	• New Freedom Kitchens	• Flat-Drawer Files	• Folding Chairs	• Sorting Files	• Shop Boxes
• Stools	• Storage Cabinets	• Tool Boxes	• Toolroom Equipment	• Revolving Bins	• Work Benches	• Drawer Units	• Tool Trays
• Bin Units	• Drawing Tables	• Parts Cases	• Wood Working Benches	• Hanging Cabinets	• Bench Drawers	• Hopper Bins	• Shop Desks

He's Boosting Low Voltages!

How? By installing an Allis-Chalmers dry-type transformer close to the load it serves. This will result in higher motor, lighting and thermal efficiency and safe, economical utilization of power for plant equipment.

Mounted on overhead trusses, these dry-type transformers free valuable floor space for production purposes. They can also be mounted on walls or columns. Vaults or expensive enclosures are not required.



They're Endurance Built

Core and coil assembly is impregnated to guard against moisture and dirt. All-welded, modern-looking case protects the internal assembly. Case is *Spra-Bonderized* to protect it against corrosion. Three coats of baked-on alkyd resinous paint furnish additional protection.

Ratings 167 kva and smaller (single phase); 300 kva and smaller (three phase), 600 volts and below.

Speed Installation

Allis-Chalmers dry-type transformers are easy to connect because junction boxes are eliminated. For connecting the conduits directly to the transformer case, knockouts are provided. System cables are connected to the transformer terminals in roomy compartments.

Easy to Maintain

Install them and forget them except for periodic inspections. No insulating liquids to mess with; no gauges or gaskets to fuss with.

You can get more information about these Allis-Chalmers Class B insulated dry-type transformers from your Allis-Chalmers district office. Or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-3829

ALLIS-CHALMERS A-C ALLIS-CHALMERS

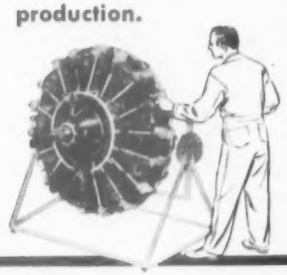
"Air horses" for lifesaving over the sea

Powered to win any race with disaster . . . utterly reliable for mercy missions over treacherous waters . . . the 1425-h.p. engine for air-sea triphibians is a marvel of modern precision engineering. To help swell volume production of this Wright Cyclone engine, Curtiss-Wright and the U. S. Air Force rely on the skill and resourcefulness of Lycoming.

Lycoming stands ready to assist *you*—whether you have "just an idea" that needs development, a problem in the blueprint stage, or a finished metal product that needs speedy, precise fabrication. Long famous in the metal-working field, Lycoming continues to meet the most exacting and diverse requirements, both industrial and military. *Whatever* your problem—look to Lycoming!

Lycoming's wealth of creative engineering ability, its 2½-million feet of floor space, its more than 6,000 machine tools stand ready to serve your needs.

To power a plane with dependable "horses"—mighty engines for hazardous air-sea rescue work—the Air Force looks to Lycoming for precision production.



AIR-COOLED ENGINES FOR AIRCRAFT AND INDUSTRIAL USES • PRECISION-AND-VOLUME MACHINE PARTS • GRAY-IRON CASTINGS • STEEL-PLATE FABRICATION

LOOK TO **LYCOMING** FOR RESEARCH FOR PRECISION PRODUCTION

LYCOMING-SPENCER DIVISION, WILLIAMSPORT, PA.
BRIDGEPORT-LYCOMING DIVISION, STRATFORD, CONN.
AVCO MANUFACTURING CORPORATION

Bridgeport-Lycoming Division
AVCO Manufacturing Corp.
Stratford, Conn.

Please send me further information on Lycoming's varied abilities and facilities.

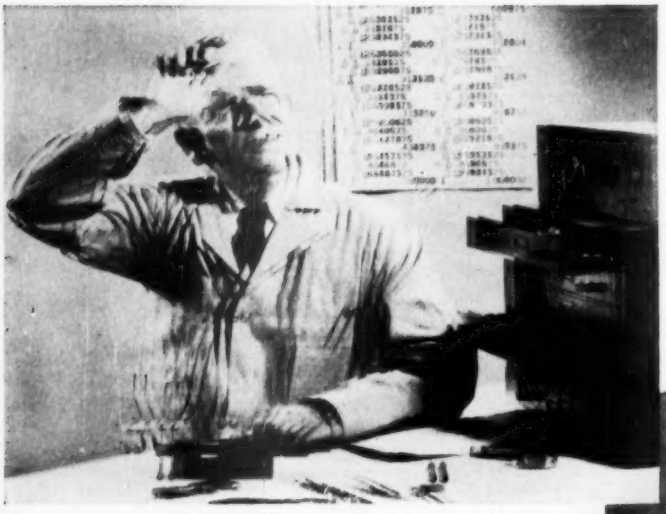
Name_____

Firm_____ Title_____

Address_____

City_____ Zone____ State____

STOP annoying blink...blink...blink



WITH WATCH DOG NO-BLINK FLUORESCENT STARTERS

Annoying fluorescent blink and excessive maintenance go hand in hand. Here's what Watch Dog* starters do about it.

- Watch Dog starters *stop blinking* by automatically turning off a failing fluorescent lamp.
- Watch Dog starters *keep the lamp off* until the red reset button is pushed when new lamp is installed. No recurring blinking every time the lights are turned on.
- Watch Dog no-blink starters *outlast* ordinary starters by as much as 10 to 1. Ballasts last longer, too.

You can stop the annoying blink of worn-out fluorescent lamps—cut starter replacement costs—cut ballast replacement costs—by seeing that *all* your fluorescent fixtures are equipped with General Electric Watch Dog no-blink starters.

Specify Watch Dog starters for new fixtures—insist on them for replacement. For a copy of folder Q33-134, which gives all the facts on the Watch Dog starter line, write Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

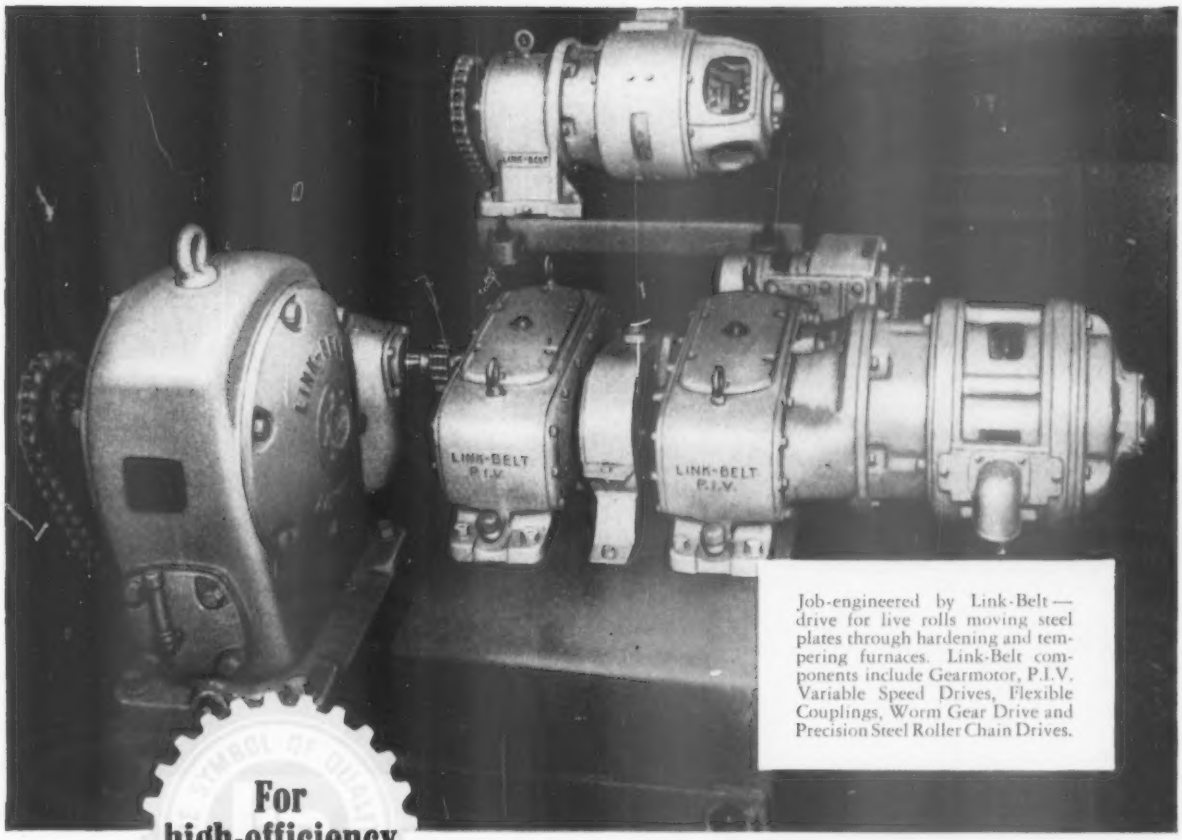
*Registered Trade-mark General Electric Company

You can put your confidence in—

GENERAL ELECTRIC

For all replacement needs—use the famous Watch Dog no-blink starter with the red reset button.

And here is the tag to look for when you buy fluorescent fixtures. It is your guarantee that the fixture has been equipped with G-E Watch Dog no-blink starters.



Job-engineered by Link-Belt — drive for live rolls moving steel plates through hardening and tempering furnaces. Link-Belt components include Gearmotor, P.I.V. Variable Speed Drives, Flexible Couplings, Worm Gear Drive and Precision Steel Roller Chain Drives.

For high-efficiency production

. . . make LINK-BELT your power transmission headquarters

Extraordinary power transmission requirements call for extraordinary engineering

AT LINK-BELT, power transmission application means far more than a mere fitting together of stock units . . .

- It means careful analysis to determine the exact drives and controls needed for optimum performance under all conditions.
- It means working out all the details for fitting controls and components to the machine.
- It may mean designing special equipment.
- It always means the best possible solution to practical power transmission problems.

Link-Belt builds and applies industry's most complete line of power transmission equipment—chain drives, fluid drives, variable speed drives, helical, herringbone and worm gear drives, bearings, clutches, couplings, etc.

Our vast knowledge of modern industrial requirements is at your disposal. Whatever the need, whatever the speed—call on Link-Belt for power transmission planning.

LINK-BELT

12,748

POWER TRANSMISSION EQUIPMENT

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices in Principal Cities.

Who says a reinforced Concrete Building can't be Destroyed by Fire...

This building, a $3,920,000 loss,
could have been saved with
Grinnell Automatic ProtectoSpray

When the smoke cleared away . . . damage to this "fireproof" warehouse, and the 150,000 tires and tubes it contained, fell just short of the four million dollar mark! What a terrific price to pay for the lesson, already well-known to many, that "fireproof" buildings often serve merely as good stoves for flammable contents.

Grinnell ProtectoSpray could have prevented this costly fire. ProtectoSpray provides automatic fire protection for many types of special hazards, where standard sprinklers would be less effective. For instance: high piled storage; flammable liquids with flash points down to kerosene; wall or floor openings; oil-filled equipment; paint storage, or wherever a directional spray is needed.

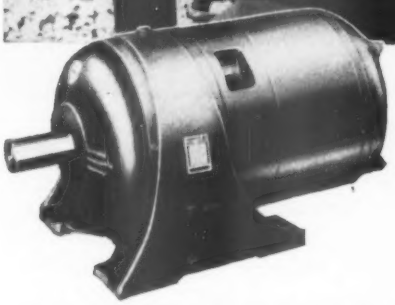
Consider your own special fire hazard . . . then write, and we will be glad to send literature on the Grinnell Automatic ProtectoSpray. Grinnell Company, Inc., Providence, R. I. Branches in principal cities.

Grinnell ProtectoSpray attacks fire in three ways: 1) water vapor from the fine spray droplets dilutes the flammable vapors already present, to make them unburnable; 2) evaporation of the fine droplets removes heat from the solid or liquid source of flammable vapors, thus cutting down the fuel supply; 3) the evaporation of the droplets reduces the temperature of the fire gases, helping to prevent fire spread.

GRINNELL
FIRE PROTECTION SYSTEMS

Manufacturing, Engineering and Installation of Automatic Sprinklers Since 1878

FOOTE BROS.-LOUIS ALLIS GEAR-MOTOR installed on Propane input pump for underground storage in a field processing plant.



When the Going's Tough

IT'S FOOTE BROS-LOUIS ALLIS GEARMOTORS FOR SERVICE

Out in the oil fields, there's no time to "baby" equipment. Quality counts and quality must be coupled with the rugged, sturdy ability to stand up under day-in and day-out service.

It is on jobs like these that the inherent stamina — the high quality — of Foote Bros.-Louis Allis Gearmotors prove themselves.

Compact in design, quality built throughout, these gearmotors incorporate Duti-Rated Gears with file-hard surfaces and resilient cores. The cast iron housings give rigidity, and the large oil reservoir with splash lubrication means continuous trouble-free operation.

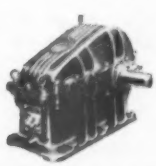
Foote Bros.-Louis Allis Gearmotors are available in single, double, and triple reductions, to provide output speeds of 780 down to 7.5 r.p.m. and capacities from 1 h.p. through 150 h.p. Open drip-proof, splash-proof, enclosed and explosion-proof motor enclosures are available.

FOOTE BROS.

Better Power Transmission Through Better Gears

LINE-O-POWER DRIVES

HYGRADE DRIVES



MAXI-POWER DRIVES

Foote Bros. Gear and Machine Corporation
Dept. I, 4545 S. Western Boulevard
Chicago 9, Illinois

Please send me Bulletin GMA containing full information on Foote Bros.-Louis Allis Gearmotors.

Name.....

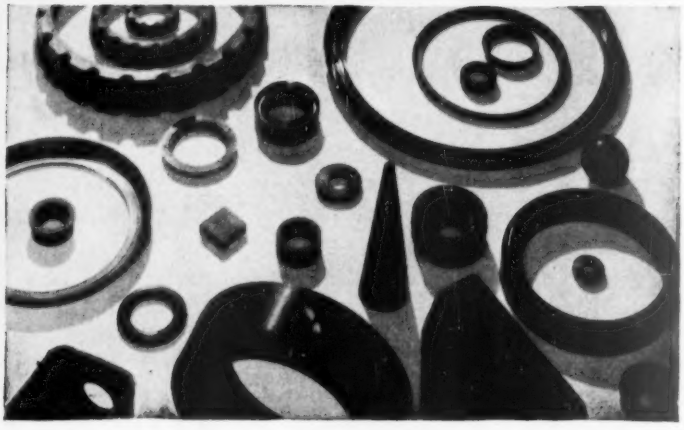
Company.....

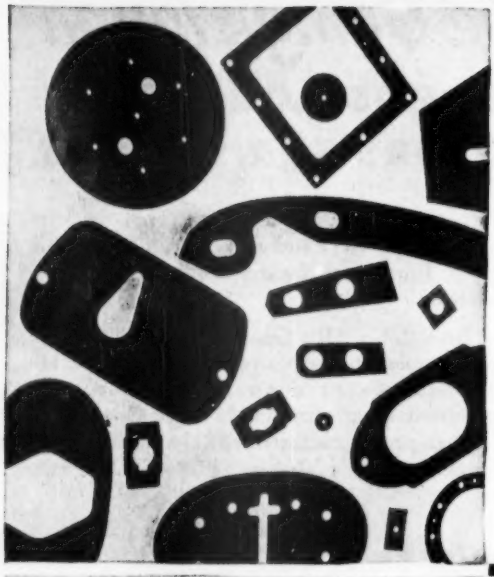
Address.....

Position.....

City.....Zone.....State.....

Unsurpassed *Synthetic* RUBBER COMPONENT PARTS





Users of Acadia Synthetic Rubber component parts in hundreds of industries have found them unsurpassed. No matter what function synthetic rubber must perform, depend on Acadia parts. They best meet exacting specifications and operating conditions such as moisture, oil, heat, wear and age resistance. Molded, extruded, die-cut to close limits—compounded to meet specific conditions. Acadia engineers will gladly cooperate.

- *Seals*
- *Gaskets*
- *Washers*
- *Cups*
- *Channel*
- *Strip*
- *"O" Rings*
- *Sheet*
- *Tubing*
- *Roll Goods*
- *Cut Parts*
- *Lathe Cut Washer*

Sheet and Roll Felt Manufactured for Special Purposes and To Meet All S.A.E. and Military Specifications.

ACADIA *Synthetic* **PRODUCTS**

Processors of Synthetic Rubber and Plastics • Sheets Extrusions • Molded Parts

DIVISION WESTERN FELT WORKS
4035-4117 OGDEN AVENUE • CHICAGO 23, ILLINOIS

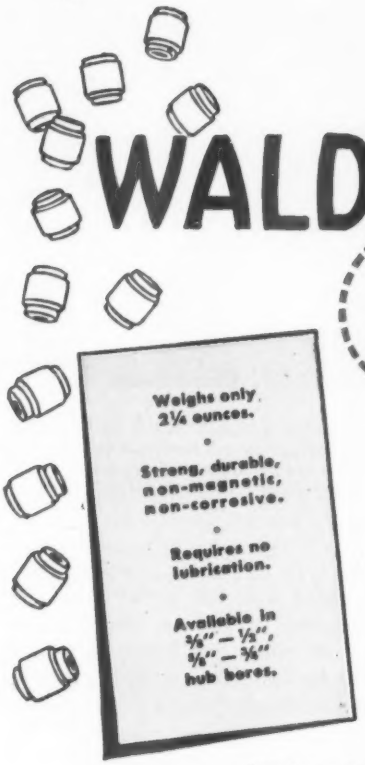
for more than 40 years a leader..

WALDRON

and now

WALDRON Junior GEAR COUPLING

Patent applied for


Weighs only 2¼ ounces.
Strong, durable, non-magnetic, non-corrosive.
Requires no lubrication.
Available in 3/8" — 1/2", 5/8" — 3/4" hub bores.

Now for the first time an inexpensive gear type coupling for the smallest fractional H.P. drives. The same major construction features of the modern gear type couplings so widely used for larger units is now available for nominal bores down to ⅜" diameter.

This amazing new WALDRON Junior Gear Type Coupling has two externally geared hubs enclosed in an internally geared sleeve that takes any size hub from ⅜" to ¾" bore. Made of smooth, tough, unbreakable nylon, it withstands corrosion and is not affected by most liquids and gases.

These small, compact, light weight WALDRON Junior Couplings now provide an economical solution to drive problems on hundreds of different types of apparatus.

Write us today for full particulars, sizes, dimensions, ratings, etc.

JOHN WALDRON CORPORATION

NEW BRUNSWICK • NEW JERSEY

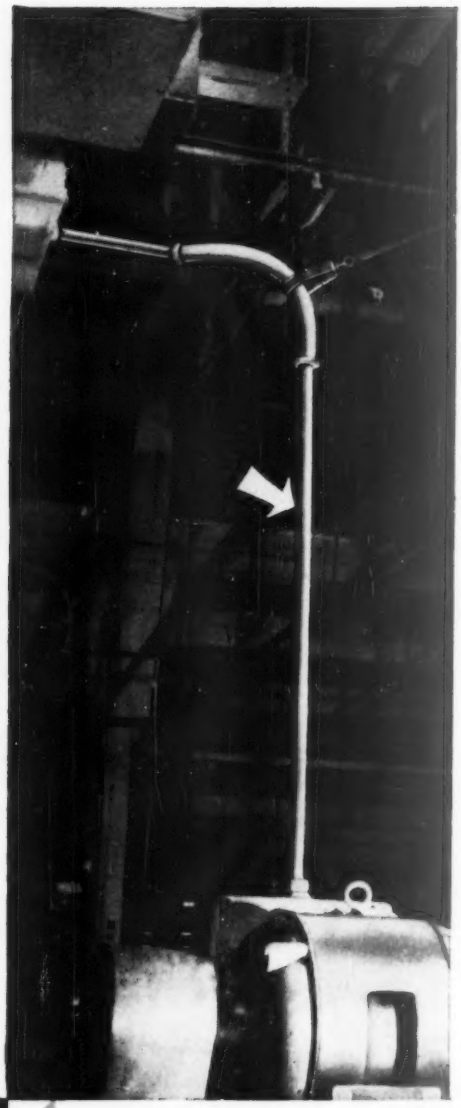
Sales Representatives In Principal Cities • In Canada—Peacock Brothers, Ltd.

How High Standard Mfg. cuts costs by using POWERDUCT from busduct to machine

"Powerduct Cable means a big saving for us," says Frederick Lynn, chief electrician at The High Standard Mfg. Corp., Hamden, Conn., makers of Hi-Standard firearms, internationally famous for their accuracy and painstaking craftsmanship.

"You'd be surprised that a very big item is being able to use Powerduct over and over again as production increases and model changes are made. Twelve feet, fifteen feet, it doesn't make any difference. I'm able to use it any place. Powerduct is never wasted. That's why it's less expensive.

"Because busduct with Powerduct means complete flexibility, we increase the use and mobility of the machine. Our crew saves many man-hours by being able to plug in Powerduct instead of wiring a whole rigid conduit system."



"For heavy equipment we plug the cutout in the busway and run the Powerduct almost directly to the machine. It's not likely this machine will be moved, so the usual loop is not necessary."

"Here's the installation for lighter equipment. By varying the size of the loop I can move the machine."

Powerduct complies with Section 3646 to the 1951 National Electrical Code.

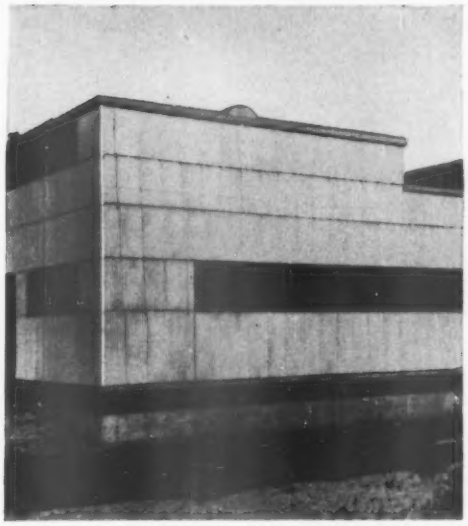
Powerduct has full Underwriters' approval, costs less than any other approved type of cable. For further details on Powerduct, contact your nearest Anaconda Distributor or Anaconda Sales Office—or write to Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

52376

the right cable for the job ANACONDA® wire and cable

CORRUGATED *Asbestos* TRANSITE*

FOR THE FACTORY



Because it is practically indestructible, Johns-Manville Corrugated Transite is extensively used in this plant to provide a durable, trouble-free exterior.

FOR THE FARM

This large barn is typical of the excellent use of Johns-Manville Corrugated Transite on farms where it helps eliminate the threat of loss from fire, destructive rot, and vermin.

You build economically and quickly with these versatile fireproof and weatherproof asbestos building sheets

In the past quarter century, Johns-Manville Corrugated Transite has proven an ideal material for roofs and for sidewalls of industrial, commercial, institutional and agricultural buildings. Made of asbestos and cement, the large sheets are easy to handle, go up quickly with a minimum of framing. Practically indestructible, Corrugated Transite is fireproof, rotproof, weatherproof; needs no paint or special treatment to preserve it; and can be salvaged and re-used if necessary.

The streamlined corrugations and attractive shadow lines of J-M Corrugated Transite have great architectural appeal . . . creating a contemporary effect in keeping with today's growing requirements for functional beauty inside as well as out.

Investigate J-M Corrugated Asbestos Transite and learn how you can build quickly and easily . . . have an attractive, long-lasting, trouble-free structure regardless of size or purpose. For complete details write Johns-Manville, Box 158, Dept. FM, New York 16, N.Y. In Canada write 199 Bay Street, Toronto, Ontario.

*Reg. U. S. Pat. Off.

EASY TO FASTEN TO STEEL

EASY TO SAW

EASY TO DRILL

EASY TO NAIL TO WOOD

Johns-Manville *Asbestos* CORRUGATED TRANSITE

From time card to travel ticket

Every angle completely covered . . . but one! When fire strikes during the night your skilled labor may go in the morning. The fully experienced Joes, Bills and Toms can't stand the financial strain of waiting . . . their time cards can become travel tickets to new jobs, while you're struggling to replace the ravages of fire.

The threat of losing your skilled labor due to an unexpected fire tragedy can be fully eliminated. With C-O-TWO Smoke or Heat Fire Detecting Systems plus C-O-TWO High Pressure or Low Pressure Carbon Dioxide Type Fire Extinguishing Systems your plant can have fast, positive, round-the-clock fire watchman service simultaneously at each fire hazard point.

At locations where a deep-seated, smoldering internal fire as well as a fast burning external fire might occur, the smoke detector of a C-O-TWO Smoke Fire Detecting System, based on an exclusive operating principle, automatically detects the first trace of smoke, smoldering or fire.

For locations where excessive heat or combustion might cause a flash fire, the heat detectors of a C-O-TWO Heat Fire Detecting System automatically sound a warning at the first flash of fire.

Then clean, dry, non-conducting, non-damaging carbon dioxide is instantly released from either a C-O-TWO High Pressure or Low Pressure Carbon Dioxide Type Fire Extinguishing System into the threatened area. The fire is out in seconds with little if any interruption to operations and the carbon dioxide disappears without a trace . . . one of the safest fire extinguishing agents known . . . harmless to equipment, materials and finishes.

WHEN BUSINESS STOPS . . . INCOME STOPS!

Don't take chances with your investment. Secure the benefits of highly efficient fire protection engineering today . . . our extensive experience over the years is at your disposal without obligation. Get the facts now!

C-O-TWO

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers
Dry Chemical Type Fire Extinguishers
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-In Smoke and Heat Fire Detecting Systems

C-O-TWO FIRE EQUIPMENT COMPANY
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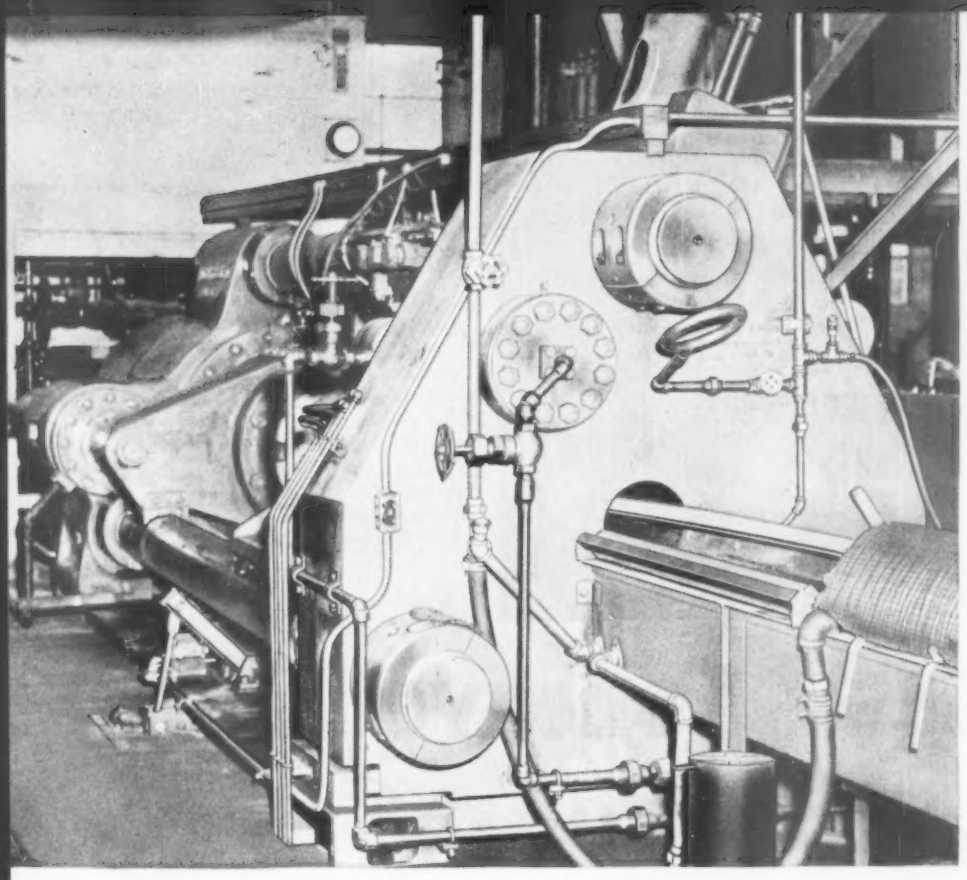
Sales and Service in the Principal Cities of United States and Canada

AFFILIATED WITH PYRENE MANUFACTURING COMPANY



Puts squeeze on hydraulic press maintenance...

● Shown above is the 1250-ton hydraulic press used by the Light Metals Corporation of Grand Rapids, Michigan, for extruding variously shaped sections of aluminum. When this press was installed recently, officials gave the important hydraulic oil job to STANOIL Industrial Oil. They based that decision on their own experience with this outstanding oil.

That experience covered over four years' use of STANOIL in the hydraulic system of a 315-ton extrusion press. STANOIL has served continuously in this press without being changed or removed for oil maintenance. The hydraulic oil system has never been cleaned and has remained entirely free from deposits and varnish. Hydraulic operation has been efficient at all times.

The experience of the Light Metals Corporation is your assurance of STANOIL's ability to reduce hydraulic system maintenance to a minimum in your plant. This

STANOIL
TRADE MARK
Industrial Oil

versatile oil will provide clean, dependable lubrication for such a variety of equipment as air compressors, reduction gears, and electric motors. The Standard Oil lubrication specialists will help you make the most effective use of STANOIL. Phone him at your local Standard Oil (Indiana) office. Or write, Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Ill.

What's YOUR problem?

D. R. Clay, of Standard Oil's Grand Rapids, Michigan, office, is the lubrication specialist who has helped Light Metals Corporation keep maintenance of hydraulic units at a minimum through use of STANOIL Industrial Oil.

He is one of many Standard Oil specialists located throughout the Midwest. These men have the practical experience and special training to handle lubrication problems on any type of operation.

Take advantage of the service offered by the lubrication specialist nearest your plant. You can contact him easily by phoning your local Standard Oil Company (Indiana) office. With his help, find how many different oils in your plant can be replaced by STANOIL Industrial Oil on such applications as:

Air compressors . . . no sticking or clogging of valves, less oil consumption in splash or circulating systems.

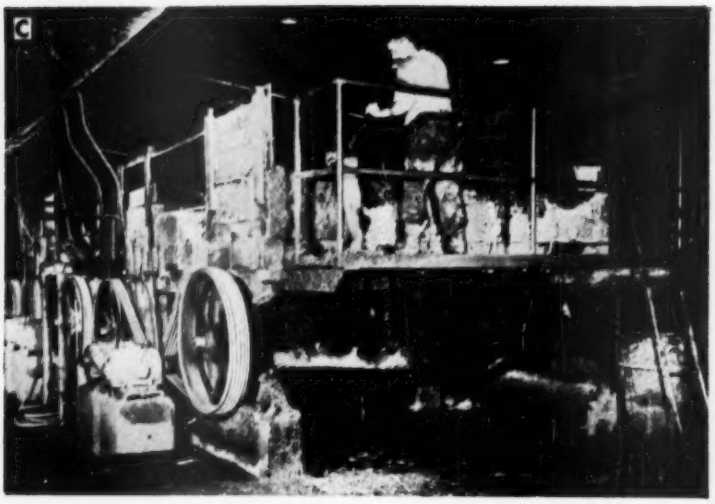
Speed reducers . . . less wear of gears and bearings during frequent cold starts or prolonged high-temperature operation.

Steam turbines . . . freedom from emulsions and sludge, fewer oil changes necessary.

Ring-oiled bearings . . . rings function immediately on starting, less bearing wear.

Circulating and both systems . . . one oil for a wide variety of jobs.

STANDARD OIL COMPANY **STANDARD** *(Indiana)*



These packer screens at the Liberty Paper Board Company, Steubenville, Ohio, were formerly driven from a lineshaft by flat belts. Gates Vulco Ropes, driving from individual motors to the same flat pulleys, have eliminated shutdowns and interruptions of operation—with total savings of $5,000 per year.

Why a V-Belt with Concave Sides Wears Longer...

—Just try this yourself!

Pick up *any* V-Belt and bend it as if it were going around a pulley. As it bends, grip its side between your fingers and thumb. Here is what you will feel—*every time.*

If the V-Belt has *straight sides,* you feel those sides *bulge out.* This forces the sides of the belt to press *unevenly* against the V-Pulley and you naturally get *concentrated* wear along the bulge —as shown in figure 1-A, below at right.

Now, try this same test with the belt that is built with CONCAVE SIDES—the Gates Vulco Rope!

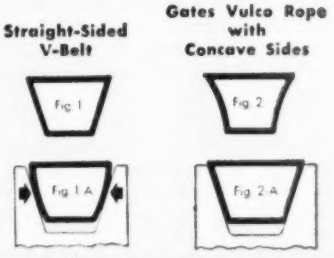
You find that the CONCAVE SIDES fill out and become perfectly straight. The sides press *evenly* against the V-Pulley. All wear is distributed *uniformly* across the *full width* of the Gates Vulco Rope—and this means *longer* belt *life* and *lower* belt *costs* for you.

The CONCAVE SIDES of Gates Vulco Ropes (U. S. Patent No. 1813698) clearly give you (1) Less wear, (2) More pulley contact, (3) More sure power transmitted when needed!

When you buy V-Belts, be sure to get the V-Belt with the CONCAVE SIDES—the Gates Vulco Rope!

Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and in 71 foreign countries.

What Happens When a V-Belt Bends



How Straight-Sided V-Belt Bulges in the Sheave-Groove. Sides Press Unevenly Against the V-Pulley, Causing Extra Wear at Point Shown by Arrows.

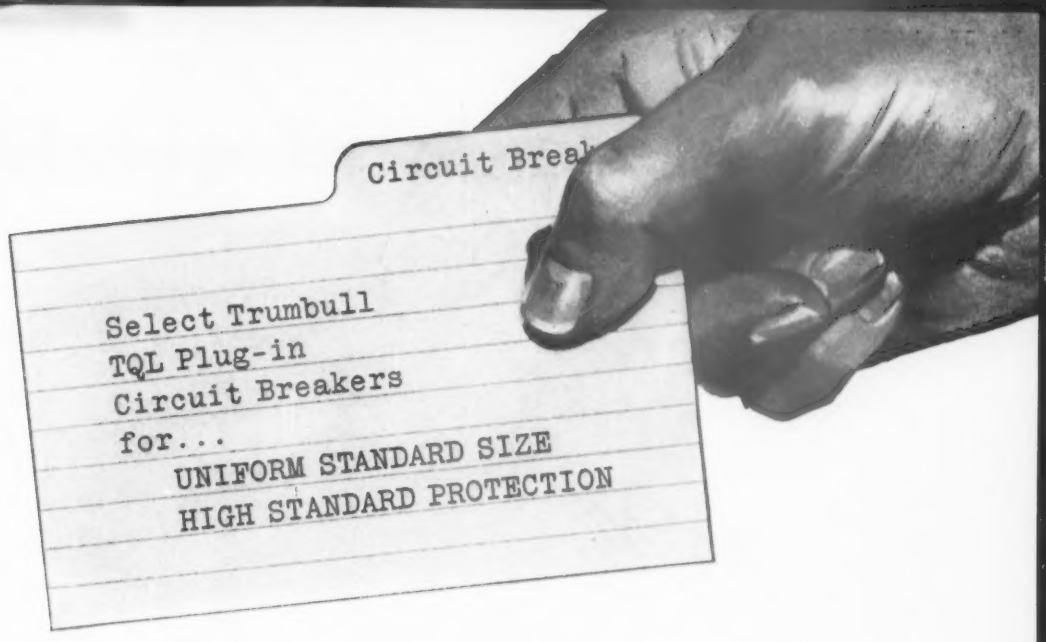
The Concave Sides Fill Out to a Precise Fit in Sheave-Groove. No Side-bulge! Sides Press Evenly Against the V-Pulley—Uniform Wear—Longer Life!

CS-5211

V-Belts — Hose
Molded Rubber Goods
for industry
World's Largest Maker of V-Belts

Gates® VULCO® ROPE DRIVES

THE GATES RUBBER COMPANY • DENVER, U.S.A.

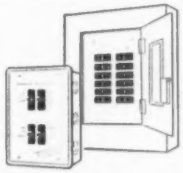


Trumbull TQL Plug-in Breakers from 10 through 50 amp. ratings are all made to the same standard dimensions — physically interchangeable not only in Trumbull Load Centers and Panelboards but also dimensions of these breakers have been adopted by leading manufacturers. This means convenience, economy and time saving for the contractor or plant electrician.

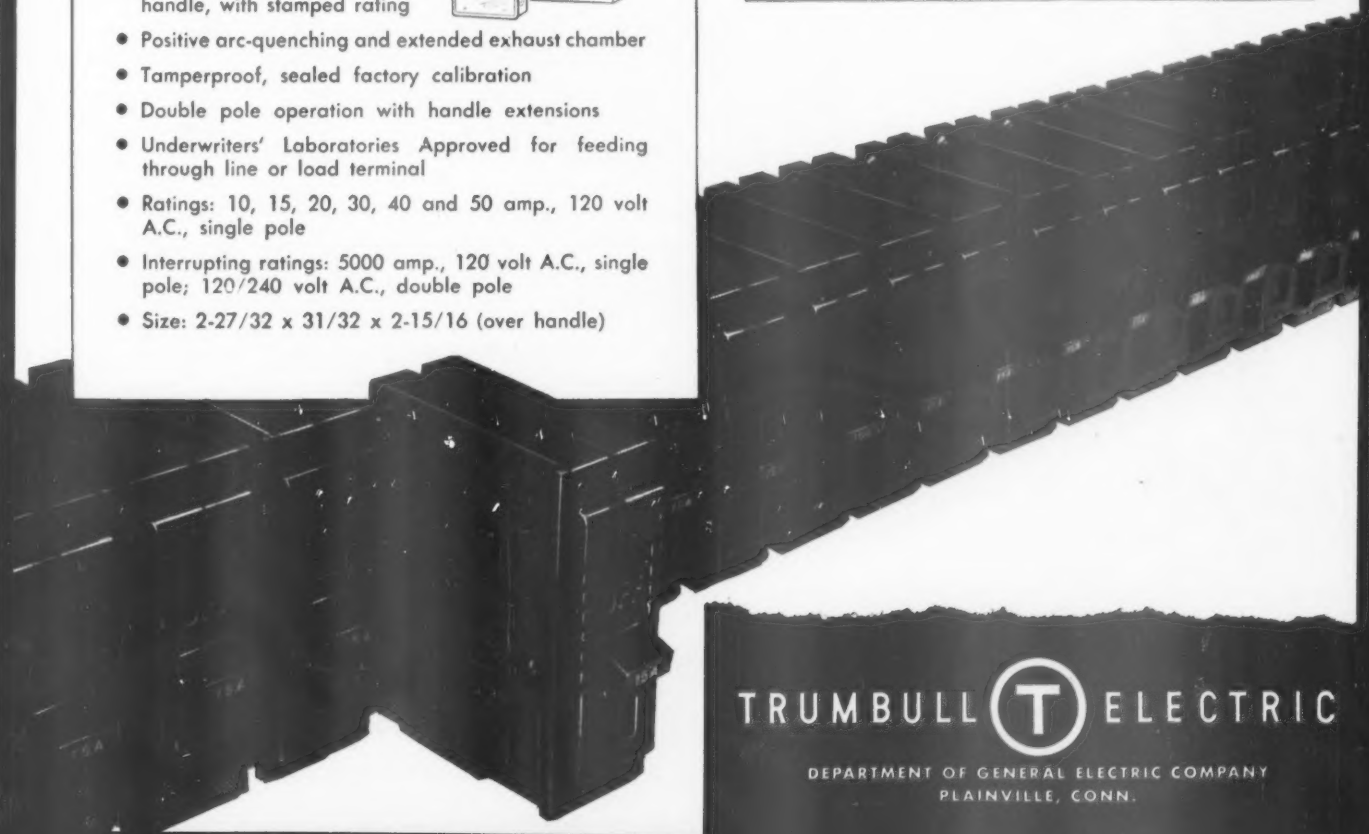
Trumbull also sets the quality and safety standard with a thermal-magnetic trip for positive protection against both shorts and sustained overloads. Compact and economical to buy and install. They pay for themselves because they are built to last a lifetime. They pay big dividends in letting you restore service quickly after short or overload is corrected. They may well save a capital investment by prevention of overheated circuits.

Leading Electrical Distributors everywhere stock Trumbull equipment. See your local Trumbull Distributor for top values and alert service. For complete descriptive literature, write for TEB-12.

Quick Facts



- Quick-make, Quick-break
- Trip indicating, trip free handle, with stamped rating
- Positive arc-quenching and extended exhaust chamber
- Tamperproof, sealed factory calibration
- Double pole operation with handle extensions
- Underwriters' Laboratories Approved for feeding through line or load terminal
- Ratings: 10, 15, 20, 30, 40 and 50 amp., 120 volt A.C., single pole
- Interrupting ratings: 5000 amp., 120 volt A.C., single pole; 120/240 volt A.C., double pole
- Size: 2-27/32 x 31/32 x 2-15/16 (over handle)

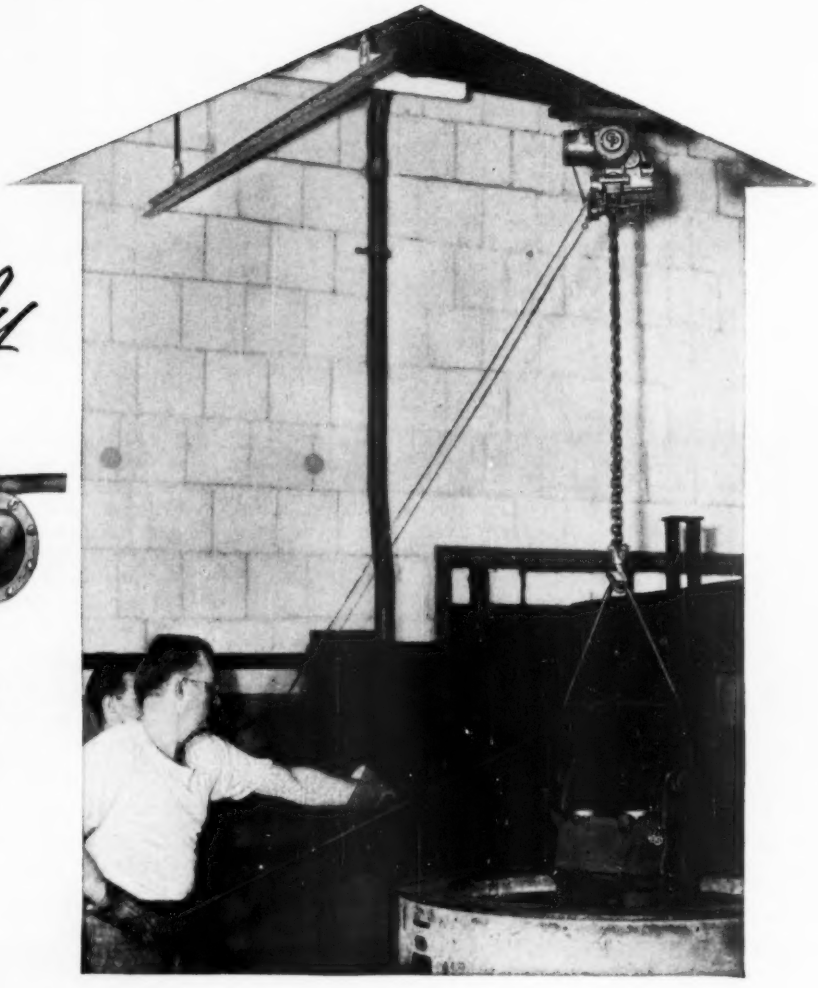


TRUMBULL (T) ELECTRIC

DEPARTMENT OF GENERAL ELECTRIC COMPANY
PLAINVILLE, CONN.

spots a load quickly–

sets it down gently



Fast and easy operation, outstanding features of the new CP AIR HOIST, are made possible by its variable speed, rotary vane air motor and its highly responsive throttle control.

It can lift a thousand pounds twenty feet a minute — or its speed may be reduced to an almost imperceptible creep.

Its air motor cannot overheat, and has no shock or spark hazard, no switches to maintain.

Automatic braking is provided by self-locking worm gear — no brake bands to adjust or replace.

A millwright can readily carry Air Hoist to any location, since it weighs only 57 pounds.

Furnished in 300, 500, 700 and 1,000 pound capacities.

CP Fiftieth ANNIVERSARY

Write for Bulletin SP-3027.

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

Master Fluid-Drive units make use of a fluid coupling so designed that it can be interposed easily between the motor shaft and the output shaft (or motor shaft and first stage of gears of a gear-motor). Use Master Fluid-Drive Motors and gain these advantages.

SMOOTH ACCELERATION. With the fluid drive, the load is gradually accelerated . . . no sudden jerk at starting.

FULL POWER. Since there is no load on the motor when it starts, it very rapidly attains full running speed and the duration of the starting current inrush is greatly reduced.

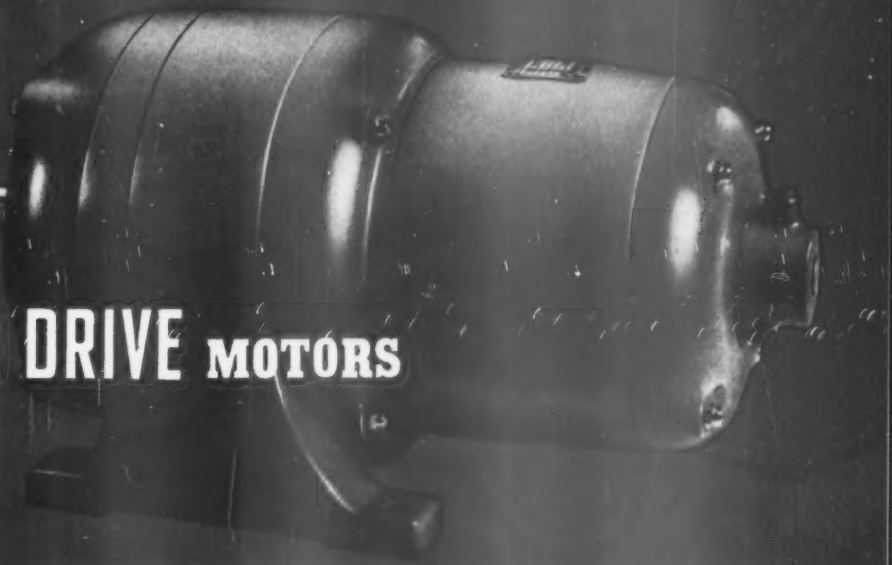
CUSHION EFFECT. Provides cushioned starting . . . protects motors, gears, and driven equipment from damage from severe shock loads.

WIDE APPLICATION. Fluid-Drive Motors are ideal for high inertia applications where it takes a long time to bring the load up to speed . . . for starting crane travel drives without jerking and swinging the load . . . for conveyor drives especially where they are handling fragile material . . . for agitators, textile machinery, presses, extruders, winding machinery, food machinery, laundry machinery, ball mills, calenders, machines, etc.

cushioned power

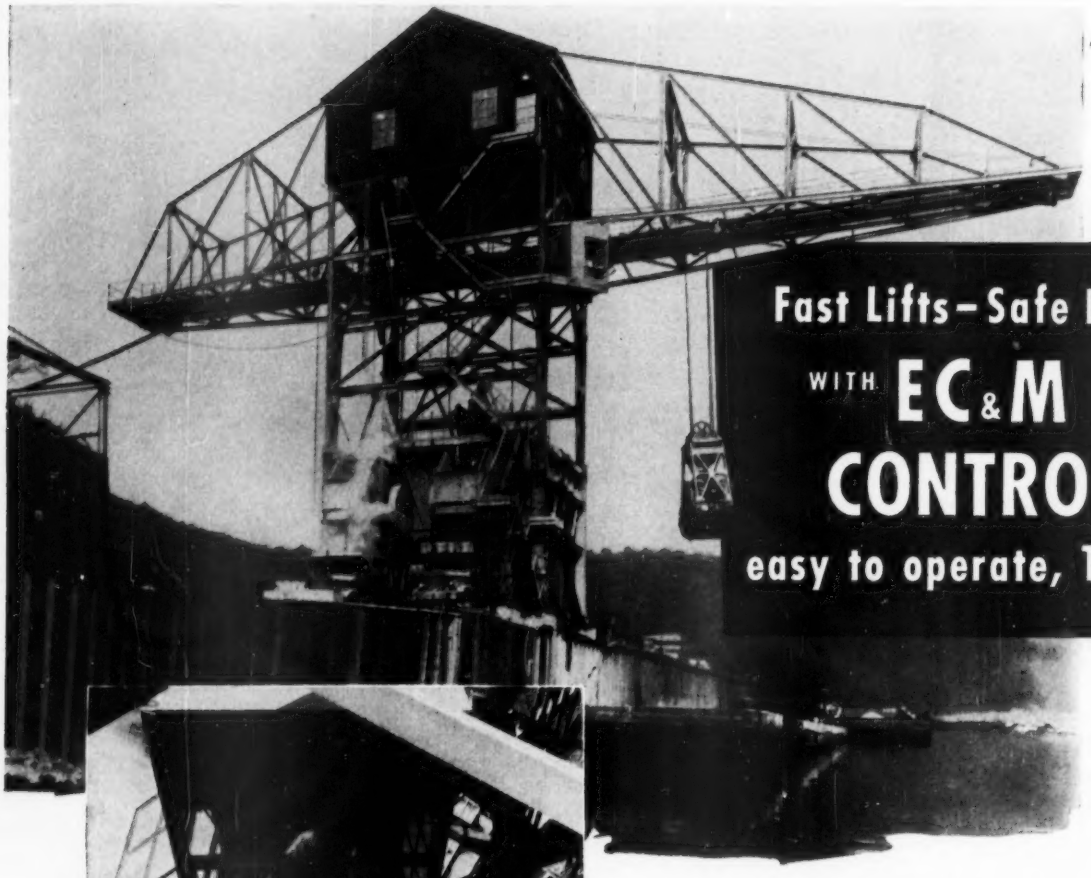
SIZES. Master Fluid-Drive Motors are available in sizes approximately ½ to 15 horsepower.

THE MASTER ELECTRIC COMPANY • DAYTON 1, OHIO



MASTER

FLUID DRIVE MOTORS



Fast Lifts–Safe Lifts WITH EC&M CONTROL easy to operate, TOO

Narrow-width EC&M Cam Master Switches are closely grouped for operator's convenience on this 720 ton-per-hour Barge Unloader, designed, fabricated and erected by Heyl & Patterson for the Duquesne Slag Company, Pittsburgh, Pa.

EC&M LINE-ARC Contactor Controllers for Closing & Holding Line Motors and for the Trolley Motion are EC&M Frequency Relay Controlled for fast, safe operation.

Output increases and costs go down when operators find rhythmic response at their finger-tips. Paying out cable to dig into the pile, taking the swing out of a loaded bucket at the point of discharge, and keeping the bucket open when lowering for another load are time-savers on bulk material-handling applications.

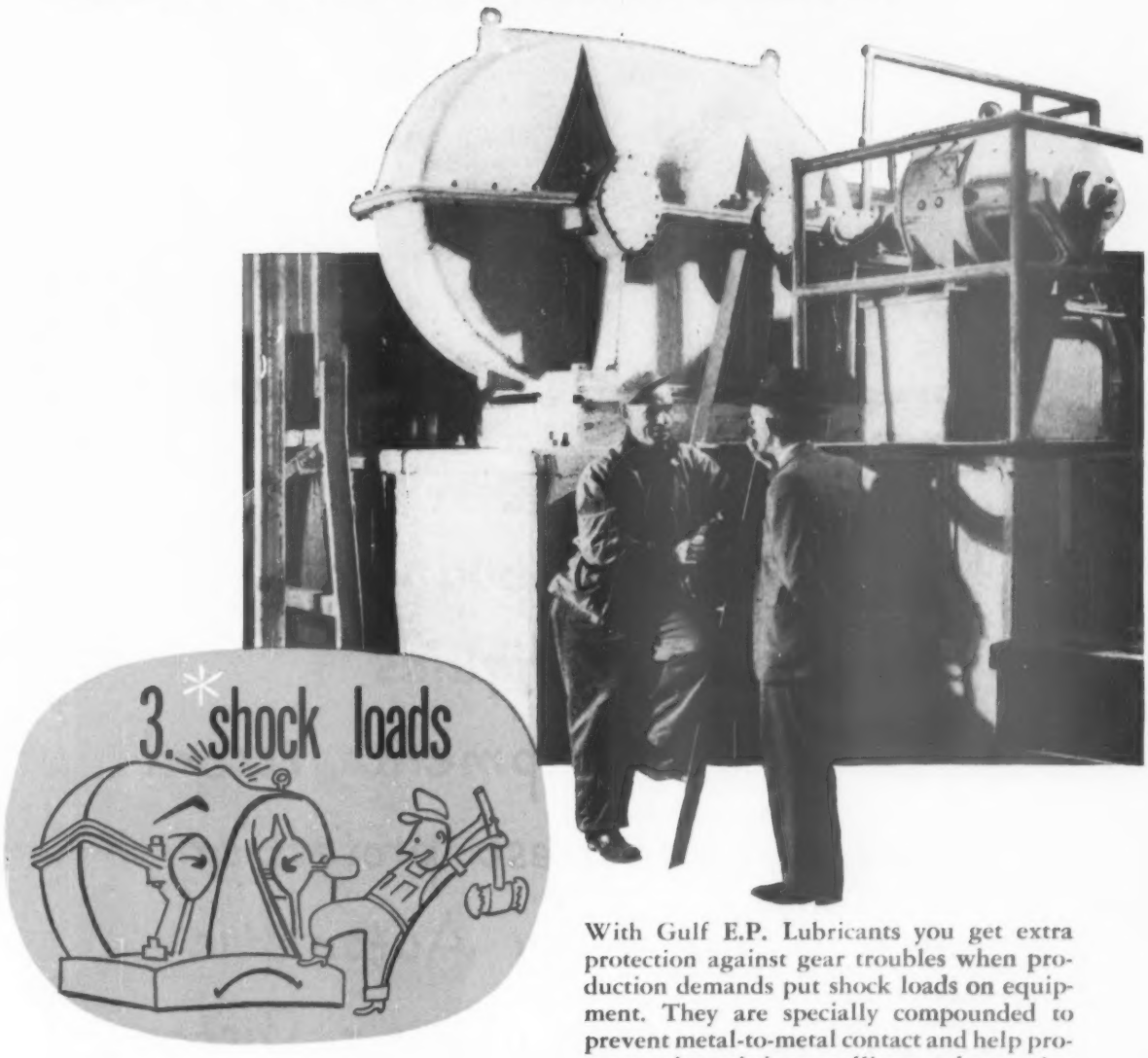
On river unloading stations, at lake and ocean ports, EC&M Control has a reputation among operating management for fast handling because bucket manipulation, trolley travel and similar operations respond quickly to the operator's needs. Straight-line, lever-operated EC&M Cam Master Switches have a short throw in both directions—are less tiring on the operator—the off-point is distinct and easy to find when returning from any of the speed-points. Put your control applications up to EC&M.

It pays to specify **EC&M Control—control engineered for high output with safety.**

THE ELECTRIC CONTROLLER & MFG. CO.
2698 EAST 79TH STREET • CLEVELAND 4, OHIO

Better gear protection
*when you need it!**

—GULF E. P. LUBRICANTS



With Gulf E.P. Lubricants you get extra protection against gear troubles when production demands put shock loads on equipment. They are specially compounded to prevent metal-to-metal contact and help protect against pitting, spalling, and excessive wear.

For specific recommendations for your equipment, call in a Gulf Sales Engineer today. Write, wire, or phone your nearest Gulf office.

GULF INDUSTRIAL LUBRICATION

Gulf Oil Corporation · Gulf Refining Company
Pittsburgh 30, Pa.

somewhere in your building,
lurking like a cat....
fire is ready to pounce.
In flammable liquids,
electrical equipment, record
vaults. Your surest protection
is a Kidde Fully Automatic
CO_2 Fire Extinguishing System.

Kidde

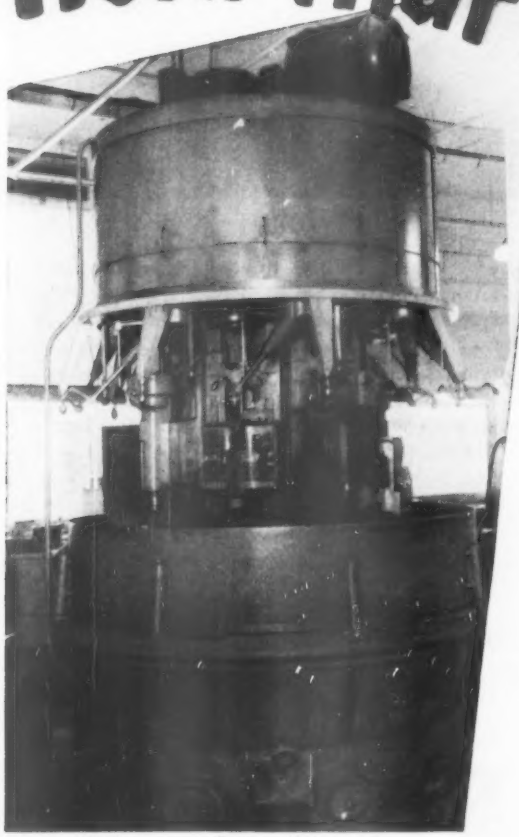
...quick as a mouse, check the "Yellow Pages" for your KIDDE dealer

Walter Kidde & Company, Inc.,
132 Main Street, Belleville 9, N. J.
Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

On Your Production Machines . . .

5 Horsepower Century Motor driving a radial drill press.

Hold That Precision Line



25 Horsepower Century Motor on a Bullard Automatic.

With

Century Motors . . .

Widely Known for Their Unusual Freedom From Vibration

Century motors supplement the precision of fine equipment . . . resulting in closer tolerance of the product produced by the equipment.

The unusual freedom from vibration in Century motors is contributed by: Accurate concentric machining to provide a uniform magnetic airgap between the rotor and stator . . . Balanced electrical design . . . careful dynamic rotor balancing . . . accurately machined mounting surfaces.

Century offers a most complete line of types and sizes from ⅛ to 400 horsepower.

Specify Century motors on your original equipment. Call a Century branch office or a Century Distributor for your motor requirements.

Century C Motors

CENTURY ELECTRIC COMPANY
1806 Pine Street
St. Louis 3, Missouri

CE-753

A man who can help you get STEEL!

In these days of great demand, the help of an experienced steel man is especially valuable. Did you realize that the services of such a man are available to you without cost or obligation? This man is your Ryerson steel service representative—a specialist in getting available steel to you quickly.

He cannot make steel, of course, but he does have up-to-the-minute information on our stocks at his finger tips. He does have years of steel experience that often enables him to recommend practical alternates when the steel you need is not on hand. And he does know every phase of Ryerson service from testing for quality to dependable delivery, including heat treating, sawing, shearing, flame cutting or otherwise preparing steel to your particular requirements.

He represents, and has the wholehearted support of, the largest steel-service organization in the world. Working closely with him are Ryerson engineers, metallurgists—authorities on carbon, alloy and stainless steels—ready for quick cooperation on unusual problems.

While we have thousands of tons of steel on hand for immediate shipment, it is spread among 15 plants from Boston to Seattle. And the recent steel strike, plus continued heavy demand, has unbalanced our stocks badly as to sizes and types. We believe this is the situation throughout the industry.

But your Ryerson service man is always ready to assist you . . . ready to help you scour the country from coast to coast to get the steel you need. So, talk over your steel problems with him the next time he calls.

PRINCIPAL PRODUCTS

CARBON STEEL BARS—Hot rolled and cold finished
STRUCTURALS—Channels, angles, beams, etc.
PLATES—Many types including Inland 4-Way Safety Plate
SHEETS—Hot and cold rolled, many types and coatings
TUBING—Seamless and welded, mechanical and boiler tubes
ALLOYS—Hot rolled, cold finished, heat treated. Also tool steel
STAINLESS—Allegheny bars, plates, sheets, tubes, etc.
MACHINERY & TOOLS—For metal fabrication

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI • CLEVELAND • DETROIT
PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

LOOKING AHEAD IN LABOR

Last-minute round-up as we go to press

In 1953 organized labor faces its biggest test since CIO split away from AFL in 1935.

The future of the labor movement hinges on what kind of record its leaders make this year in reacting to new, and largely unfavorable, conditions.

All at once, organized labor . . .

- Sports new top leadership.
- Finds in the White House a Republican it fought hard at the polls.
- Faces an even more conservative Congress.
- Is split over lifting wage-price controls.
- Has one of its own as Secretary of Labor.
- And makes another stab at reuniting AFL and CIO.

(Our odds are 10-1 against it.)

•

What will happen? Keep your eyes on CIO. It is hurt most by sudden turn of events. That means watching Walter Reuther, the new president. CIO is in trouble. Never before has it dealt with a Republican or any non-partisan in the White House. Worse still for CIO, it has lost dominance over AFL in relations with the White House, with Congress. AFL is taking over. It has Martin Durkin in Eisenhower's cabinet, is playing ball with Senator Taft on revising Taft-Hartley. As George Meany put it:

"The AFL will not be Eisenhower's 'loyal opposition.' Between elections it will cooperate with the government, keep trying to raise living standards."

CIO is in trouble on other fronts. Membership is down, only half of AFL's 9-million. It has made little inroad on left-wing unions expelled in 1949. This makes CIO weak in bargaining with AFL.

•

Then there is John L. Lewis to watch, too. He has many friends in CIO. Hates Reuther to the core. Detests Meany almost as much.

That assures United Mine Workers will be kept out of labor unity talks this time. Meany will make things harder for CIO. He got off to a good start as AFL president, winning friends on all sides. He pleased workers by reviving unity moves, Eisenhower by promising cooperation, Taft by agreeing to help amend — not repeal — Taft-Hartley, and the Democrats by supporting wage-price controls. (Reuther and CIO want wage controls lifted.) Meany will give AFL vigorous leadership long absent. He'll take no back seat to Reuther

For management it means more jurisdictional troubles ahead, more election campaigns as unions vie for bargaining control. Fewer strikes. Unless employers try to "get even."

•

Already unions show a willingness to call off strikes. They don't like the Republican climate. Some big ones just settled: Goodyear Aircraft, General Cable, SKF Industries, Sylvania Electric, American Brake Shoe, West Virginia Pulp & Paper, International Harvester.

Durkin's appointment won't help strengthen the the Labor Department, as Eisenhower promised. Fact is, it might undergo more stringencies. This Congress will not likely give the department new powers or more funds. Not with the president of the AFL Plumbers and Steamfitters running it.

Any chance of putting the Conciliation Service back in the Labor Department is gone. Durkin also will ask for the National Labor Relations Board. Impossible. Actually, Durkin may have to fight to keep what's in the department now.

Mrs. Oveta Culp Hobby figures on getting Employment Service back in Federal Security Agency.

•

Until Durkin's "incredible" appointment — as Taft called it — it looked like Congress would not touch Walsh-Healey or Wage-Hour Law. It was expected the new secretary would clear up employer complaints by fairer administration. Now there is a better chance, though still remote, that Congress will step in to curb abuses by the administrators.

Straws in the Wind . . .

- Triple pay for work on holidays has been won at B. F. Goodrich, U. S. Rubber, Firestone. Will spread.
- Escalator contracts must be adjusted to new cost-of-living index. Again, watch Reuther.
- UAW-CIO is policing discrimination in hiring women and Negroes at the plant gate.
- James L. Matles, top organizer for left-wing United Electrical Workers, may lose citizenship. Department of Justice says he lied in denying Communist affiliation when he became citizen. Another Harry Bridges case.
- CIO Chemical Workers say members at Foote Mineral Co. now get their birthday off, with pay.

SEE PRACTICAL LABOR RELATIONS, PAGE 218

LOOKING AHEAD IN BUSINESS

Last-minute round-up as we go to press

Consumer income has soared to a new high after being in the doldrums for about a year. From the middle of 1951 until this fall, consumer income showed little growth. During the last 3 months it has risen at an annual rate of $7-billion a year. This is the power behind the recent climb in business activity.

Because consumers had more money in their pockets, they went into the stores and made this the biggest Christmas season in history for the retailers. December retail sales are likely to average 8% over a year ago. Unfortunately, this glowing sales record has not been passed on to the factories in new orders. New factory orders remain about the same as a year ago.

The retail boom is cause for cheer, nevertheless, among factory managements. If consumer income and retail sales hold to these high levels, factory production can continue to roll at its very impressive rate.

•

Factory output still continues to climb. The Federal Reserve index of industrial production is up to 230, compared to 220 during most of last year and this. Factory production, in fact, is pushing ahead faster than retail sales — at least in some industries. Here is a comparison of recent factory production to retail sales in some important consumer lines:

Product	Increase From 4th Quarter, 1951, to 4th Quarter, 1952	
	Retail Sales (in units)	Factory Production
Automobiles	15%	18%
Major appliances	11	12
Television sets	55	80
Textiles	9	9
Shoes	10	20

Although consumer incomes and buying have grown, factory capacity and output in many industries have grown even faster. This is the stuff from which readjustments are made. If production outpaces buying in 1953, factory managers will have to slow down output. Whether this will be necessary or not turns in part on the outlook for consumer income and spending.

It is difficult to say anything about consumer income without getting into a round-robin. Income arises out of production. It seems like putting the cart before the horse to try to measure income first in order to see what production will be. The only reason for trying to do this is that, temporarily, consumer income and spending can affect the level of production. Let's put it another way. Over the long period, production *determines* income. In the short period, it *adjusts to* income.

•

We are now in a period of transition, changing from a defense economy to more of a private, consumer's economy. This change will take place over a short period of time, during the months ahead. As a result, the level of consumer income will have much to do with the smoothness of this change. If consumer income and spending hold up or rise, factory output will switch from defense production to more consumer production with ease. If factory output must adjust both to lower incomes and to more consumer-type production, the going will be rougher.

The outlook for consumer income is, fortunately, good. There are slightly more people working now than a year ago. Unemployment is at a new low. The number of hours worked per week has increased slightly, from an average 40-hour week in early 1952 to a shade over 41 hours. This means that some of the increased income has come from overtime. The average weekly wage has increased almost five dollars a week. A good share of this comes from higher wage rates.

•

Employment, hours, and wage rates will probably hold up fairly well in the early part of 1953. This spring more wage contracts can be opened for bargaining than at any one time for several years. As a guess, perhaps half of the manufacturing workers may seek wage increases. Factory managements will have a critical decision to make in their wage policies. To the extent that wage increases can be granted without hurting capital spending plans or dividends, they will help bolster consumer income and ease the transition. But, if further wage increases raise costs and prices, factories will begin pricing themselves out of high-volume sales. Factories badly need high-volume sales with their present capacity. A good wage policy, to help maintain consumer income and still not outprice the market, would seem to be to keep increases in line with cost-reduction programs.

To keep production moving, keep valve quality high

FIG. 123

N·M·D

(Non-Metallic-Disc)

BRONZE VALVE

Correctly engineered for long life in handling steam, hot water, cold water, air and gas, oil, gasoline, butane, propane.

Any plant, regardless of type or size, uses valves—bronze, iron, or steel. Industry relies on Lunkenheimer Valves that stay on the job, year-in, year-out . . . helping sustain continuous peak production. And that's why Lunkenheimer quality is so essential today.

Industry's faith in Lunkenheimer Valves is based on nearly a hundred years of experience with Lunkenheimer design, materials, and workmanship.

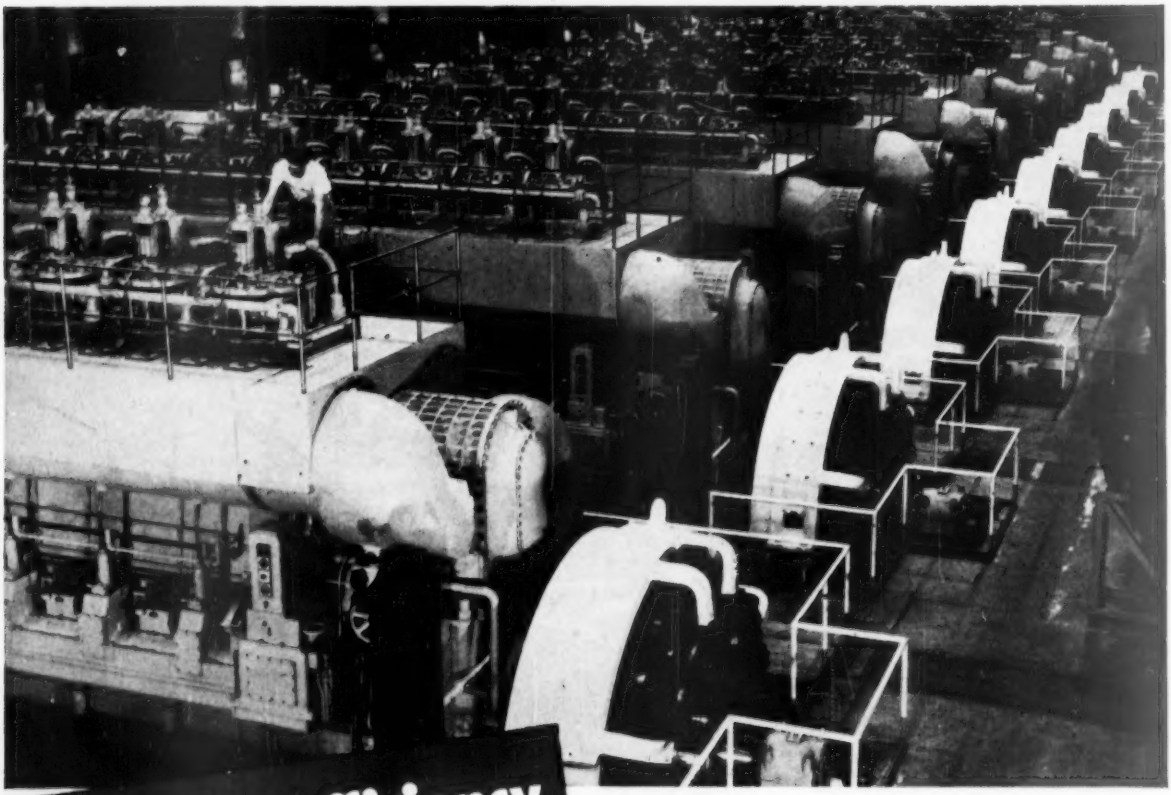
BRONZE • IRON • STEEL

LUNKENHEIMER

THE ONE *Great* NAME IN VALVES

L-152-26

REYNOLDS METALS



gets top efficiency with TEXACO

In the Reynolds Metals Company aluminum reduction plant at Jones Mills, Arkansas, eighteen of these giant gas Diesel engines have been lubricated with *Texaco Ursa Oil* for nearly ten years.

Results have been: clean, efficient, full power operation . . . low maintenance cost . . . and fuel economy.

Wherever used, Texaco Lubricants and Texaco Lubrication Engineering Service play a big part in stepping up production and reducing unit costs.

That is why, throughout the 48 States, Texaco is preferred in so many fields – a few of which are: copper mining, aviation, railroads, Diesel power plants and others.

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TEXACO

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TUNE IN . . . TEXACO STAR THEATER starring MILTON BERLE, on television Tuesday nights. METROPOLITAN OPERA radio broadcasts Saturday afternoons.

FACTORY MANAGEMENT AND MAINTENANCE

HARRY LEE WADDELL, EDITOR

Streamlined organization...

. . . **is a necessity in any plant that becomes even partially automatic in its processes.** Most companies that "go automatic" find this out early and adjust their organizational set-ups accordingly.

They must decentralize decision-making right to the point where the decision is effective. There is no time for committee meetings to decide what to do about a pressing problem when that problem may be shutting down a whole plant's operation. The man on the spot must have the authority to decide what's to be done—and to do it.

This greater need for initiative further down the line does not mean looser organization. Quite the reverse. It requires clearer lines of organization from the top right down to the on-the-spot supervisor. The man down the line can't make the right decisions unless he knows the policies and objectives—and the reasons behind them—of all the levels of command above him.

Another point: Highly automatic factory operations require a company-wide organization that is as streamlined as the plant itself. Automation can't begin at the factory receiving dock and end at the shipping platform. If it does, it won't work. Market analysis and product design and production planning, purchasing programs, distribution, and sales planning must all be tied together with production—and with each other—into an integrated unit with a common purpose.

This means that no department can operate as a little "duchy"—going its own way without regard to the rest of the company. An organizational set-up that mistakes this kind of scatteration for real decentralization is headed for trouble.

But what about the company that feels secure in its present production methods and isn't planning to "go automatic"? Certainly there is no urgent need for it to streamline its organization.

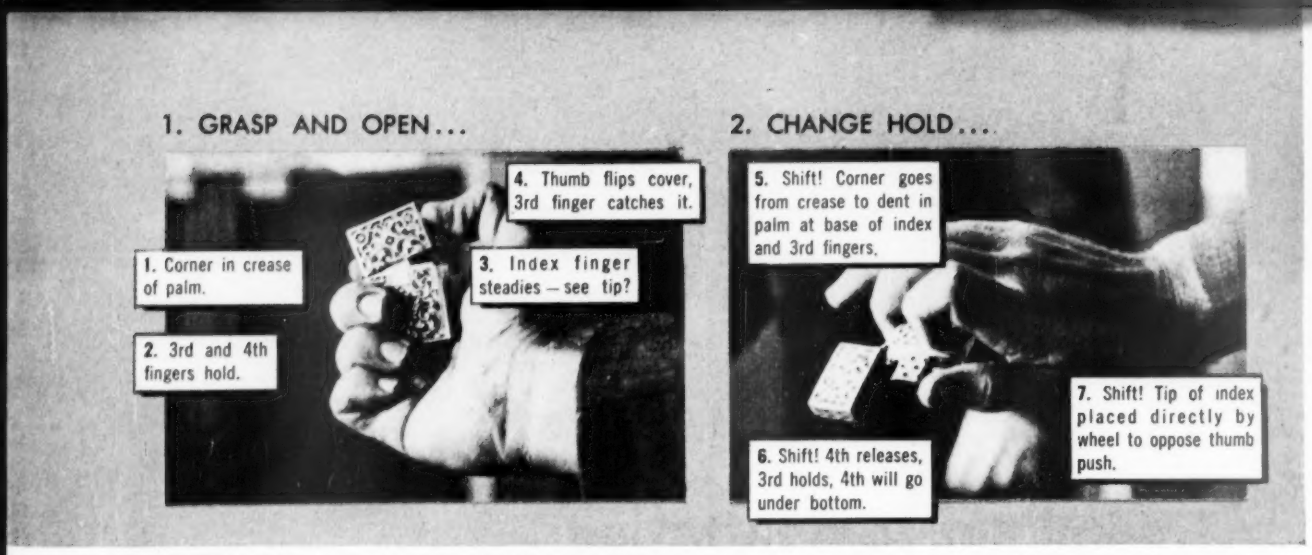
If yours is such a company, don't be too sure. When the companies you do business with become more automatic in their operations, they make new demands on you. They must integrate you into their total planning and scheduling. You must be nearly as much a part of the "team" as their own departments. And so you must meet one of the prime requirements of automation—a streamlined organization—even if you don't plan automaticity for yourself.

We had lunch the other day with two executives of a company in exactly this spot. One of their principal customers had come to them to find out, among other things, whether the supplier-company's procurement and purchasing program was so well planned that the customer-company could be absolutely safe in expecting on-time deliveries many months hence—as part of its production and inventory-control planning. Past performance wasn't guarantee enough.

The two executives had come halfway across the United States to find out what "automatic" companies—or those preparing for it—were doing to streamline their procurement planning. They found their company needed the same sort of organizational set-up as companies that were going into automatic production. Yet their company had not even considered the possibility of automatic production.

So, when you read about trends to automatic production — such as our article in the last issue about Ford's new engine plant — you may pick up more than production ideas. You'll get a feeling of the great amount of total planning that must accompany such technology. There are going to be many plants in the future as automatic as Ford's —and more so. No company will escape their impact, regardless of what it does in its own plant.

Harry Lee Waddell


1. GRASP AND OPEN...
1. Corner in crease of palm.
2. 3rd and 4th fingers hold.
3. Index finger steadies – see tip?
4. Thumb flips cover, 3rd finger catches it.
2. CHANGE HOLD...
5. Shift! Corner goes from crease to dent in palm at base of index and 3rd fingers.
6. Shift! 4th releases, 3rd holds, 4th will go under bottom.
7. Shift! Tip of index placed directly by wheel to oppose thumb push.

THE PHOTO WAY of teaching a simple skill—in this case, how to operate a cigarette lighter—is just one of the many ways you can use a camera to get your ideas across. And, to prove how easy it is, Author Bill Worthington took these four closeups

To get that idea across...

Better Say It With Photos

By WILLIAM BOWMAN WORTHINGTON • Management Engineer

You can use a camera like you'd use an extra fountain pen, says Author Bill Worthington. And it's not tough to do, either.

Here's his story of how he got started on what may sound like a hobby but actually turned out to be a real business asset. Sounds to us like lots of good sense—an idea many FACTORY readers will spark to, and benefit from.

Another point: **You probably read "How to Rough-Sketch Your Ideas on Paper" (December 1952, page 84). This article gives you another approach to the same problem of getting your ideas across. The two techniques supplement each other nicely.**

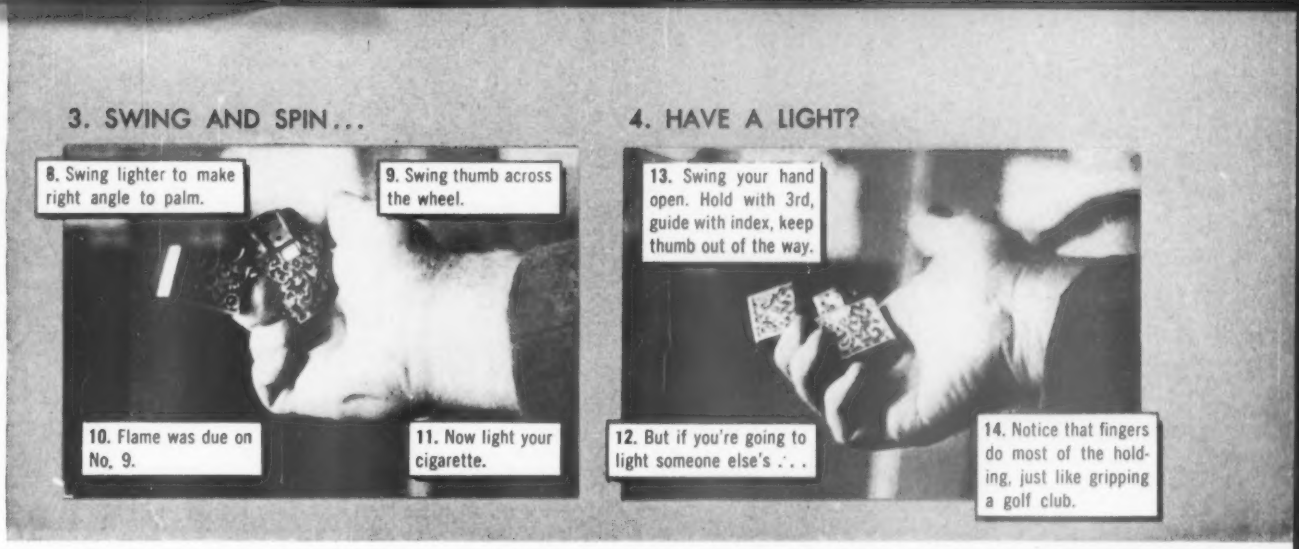
1. How did I get interested in photos as a way to get ideas across?

Simple. I was looking for a bridge across a language barrier. I was consulting for an oil company operating in Saudi Arabia. Nine out of ten employees were Arabians, right out of the desert. The problem was to find a *good* method of communication, to show employees *how to do* simple mechanical jobs.

The second part of the problem made itself evident fast: *How to show the boss what had to be done*—miles away in geography and 5000 years away in time.

It took a lot to shove it through my thick skull that we could avoid plenty of grief by using a common language that was available—pictures, that is, taken on the spot, of the specific things and conditions we were working with.

The Arabs like pictures. They can read them. So can Americans. What's more, it's hard to *misread* a picture. None of this business of thinking a man stupid because he doesn't use socket wrench-


3. SWING AND SPIN...
8. Swing lighter to make right angle to palm.
9. Swing thumb across the wheel.
10. Flame was due on No. 9.
11. Now light your cigarette.
4. HAVE A LIGHT?
13. Swing your hand open. Hold with 3rd, guide with index, keep thumb out of the way.
12. But if you're going to light someone else's . . .
14. Notice that fingers do most of the holding, just like gripping a golf club.

while gabbing with a couple of FACTORY editors. Just hauled a camera out of his pocket and fired away. Took him less than 2 minutes. The hand that holds the lighter is Bill's. He used his left hand to steady camera against wall and shoot.

es when he's lucky to have or understand a pair of pliers.

Anyway, I tried pictures, and they worked. I started with a couple of simple operation sequences, without words, and found that each could be described in an hour's work with a pocket camera. Also that a completely non-literate workman could follow at a rate comparable to that of our boys at home.

First application: an hour's shots of a job which got across a salary evaluation story. Settled a hassle about pay rates that had hung up for two years because neither party really knew what the other was talking about.

2. How can *you* use photography as a working tool?

Use a camera like you'd use an extra fountain pen. Consider it as a writing tool for picture language. None of us can be a Michelangelo, but with a camera any of us can make a quick and accurate sketch of a set of conditions and facts. Further, by picking successive stages, we can depict a sequence of actions, as do the comic strips (which are definitely read, and definitely understood!).

Don't send a pro photographer to kill half a day of a department's time making one perfect shot, when half a minute is all it takes to haul a camera from a pocket, bang the scene, and stick it away. (The pro will do a swell job, though, if you can assure him that you won't think he's a bum because he doesn't get advertising perfection in shots intended for quickie records in the first place! Would you ask a secretary to turn out a Gettysburg address every time she answers a guy's letter?) Incidentally, this seems to be a *principal* reason for lack of development of photography as a language of industry.

3. Do I feel that the potentialities of photography are as yet unappreciated in this country?

I sure do! That's why I'm taking the trouble to try to do something about it, and I'm *not* doing it for love of photography! I'm doing it because we have some industrial headaches in this country that I think we can cure, in large measure, with better use of this particular communication tool.

Nor can I decry the next fellow's lack of insight for missing this obvious tool at hand, when I consider the sledge-hammer set of circumstances that it took to get it through my *own* head.

But we can look around us. *Life* does OK. So do the comic books. So does the *Daily News*. Manufacturers' sales literature does swell. Dance schools use picture sequences. So do Boy Scout handbooks and the Armed Services manuals, especially the Marine and Navy handbooks.

Notice I didn't say anything about movies. They rate as another *principal* reason why pocket camera stills aren't used. Speak of pictures and most men in industry think immediately of mass training.

This is OK. It would be swell, *except* that 90% of the jobs in industry are *not* mass jobs. And if they were, they'd have already been mechanized! If it's that routine, we can usually build a machine for it, or will shortly.

4. What benefits will you get from more extensive use of photography?

1. You'll learn an awful lot about your own business, quick.
2. You'll learn a lot more about your staff people, even quicker! (Details on request, only!)
3. You'll learn most about yourself, but not so

quick. That takes time, even when the facts are on the table. The same things apply to the people working for you.

5. Who's the best person to do the photographic work?

Hard to pin down, but I'd say anybody who's interested. *You*, for example.

It doesn't require much knowledge of photography, but it *does* require a *clear* understanding of what you are trying to write down.

The job is similar to that of a writer: Once he determines what he wants to say, then how to say it is usually fairly simple.

Professional standards of photography aren't applicable, even as you'd hardly need a ranking novelist to write a letter to the New York office.

Just as long as the guy knows what he wants to say, he can say it with a camera. One thing is tougher—telling a story that is not so.

6. Is this a very costly business? In time and money?

Take another look at the cigarette lighter sequence on page 84. FACTORY's editors saw me shoot that one. It's characteristic of any use of the camera as a writing tool. Same as a fountain pen!

Camera used was a Retina I, with 35-mm XX film. Total equipment: $100 (I bought the camera second-hand). I've also used a Kodak Bantam a lot: cost—$60. I even have a sample done with a Brownie: cost—$8.

I suggest any camera that can go in a pocket. A bigger one scares people.

A pocket tripod may help, sometimes, when copying a record in an office. But *don't* carry it. It's a liability, not an asset.

Same goes for a light meter. You should be sufficiently familiar with your premises to know the settings. Once set, you can go on from there.

Developing and printing? There's bound to be someone within brick-throwing range who can do what you want. He ought to get the idea on about the third try he makes.

For sure: If you spend more than $100 (maybe $200 if you buy a new camera), you'll be off the same deep end that makes the movie training films non-applicable for the average industrial use. (Don't get me wrong. There are times when the movies are the only way, the best way, and the way to use. They are absolutely tops where they fit. So is this method I've outlined here!)

For consideration: I haven't tried this, but the theory is wonderful. Use a Land Polaroid camera. Shoot your shot, develop it right there within a minute, show it to the other people involved. If it isn't what you want, shoot again till you get the right result. No waiting for development. And you get approval of local people on the spot.

7. How can an interested executive get started?

If I knew just how each one's mind worked, I'd know the answer. But I don't.

These things I *do* know:

1. You can't discuss it. Only way is do it, then show results.

2. Carry the camera like a fountain pen, so when the little glimmer of an idea comes, you can get going on it.

3. Planning and methodizing and formalizing at the start simply lead to conclusive proof of the impossibility of doing anything.

4. Shoot your shots of what you want to record or describe. Then after developing, puzzle them into sequence, and add any labels you need.

5. It helps a lot if the man doing the job pictured, and helping with assembly of the prints, knows the job thoroughly, even if he can't express it. How can you say or write when you do not know what you are trying to say or write? You find someone who *does* know! **Usually this is the man on the job.**

6. Shoot under the light on the job. No extras. Nothing not available on the spot. Lay off flash equipment. Too much gear.

7. Perhaps this should have been first, but start with a problem you think you may be able to solve.

8. Don't start unless there is a reason for your action. When you do start, shoot right ahead, regardless. It's a sure bet that your results will be: (a) better than you think; (b) hopeless at one stage or other; (c) OK in the end, unless you think each step through at the time you do it.

8. Is there a danger that you'll be accused of "boondoggling," wasting time and money?

Sure is, but no more so than on anything else that just hasn't been used before.

This is a definite problem. I don't know a pat solution. But I *do* know that the laughers do not laugh half as much when they are over the barrel with a nasty problem, and are spread-eagled to the extent that *any* solution is welcome, so long as it gets them off the hook. There's darn little laughing then!

Motorola's imaginative plan...

Keeps Workers Sold on Profit Sharing

It's a big job, no matter how good or how liberal your plan is. Motorola's savings and profit-sharing plan is one of the most liberal, yet the company put a lot of hard work and imagination into keeping workers sold. It pays off.

By KENNETH M. PIPER • Director of Human Relations, Motorola, Inc., Chicago

WE'RE PROUD of our savings and profit-sharing plan. It covers all of us—including our president—and gives us all the kind of financial independence we think we ought to have. As a result, we feel we have about the best teamwork we could ask for.

We can't say that all benefits we're enjoying are due just to profit sharing. But we *have* had increasingly better quality and productivity since 1947, when the plan was set up. We've had surprisingly little trouble recruiting new employees, despite a tight labor market. And turnover has been far lower than you'd expect in such a market.

Obviously, part of our steadily improving record is the result of better facilities, better training, and better supervision. But we know that profit sharing has also been important.

To put it another way: We don't feel we'd be doing as well today if we didn't have profit sharing —and if we didn't work to maintain interest.

We're sure of one thing: You can expect little benefit from a profit-sharing plan unless you and your employees are really sold on it. We think we've done a pretty good job of explaining and selling. Here's how we've done it.

We build up interest in the plan...

... **by our employment advertising.** The selling job starts even before we see an employee. The ads are the opening gun in a campaign that will last as long as he—or she—stays with the company.

... **by booklet.** Each new employee gets a copy of "Welcome to Motorola." This booklet is designed primarily to acquaint the new employee with the company policy and employee benefits. A brief description of how profit sharing works, and its importance, is on one of the first pages. In this booklet, the new employee gets acquainted with "Prof Sharin," the symbol of profit sharing at Motorola. As you'll see, he turns up everywhere. You might call him the "gimmick" in our plan. He's a constant reminder to our employees that "Profit Takers Must be Profit Makers"—that the security offered by the plan must be earned security.

PROF SHARIN

... **by our indoctrination movie.** A large portion of this film is devoted to a follow-up explanation of the profit-sharing plan. It emphasizes to the new worker that all employees are depending on him to do his part in building profits, by keeping his own production and quality up to the mark.

... **by sponsors.** Each new worker, when he reports to his foreman, is assigned a sponsor—one of his fellow-workers. Sponsors are selected and trained by the company. Over a meal in the cafeteria, supplied free by the company, the sponsor gives the new worker the story of profit sharing (and other employee benefits, of course) in an informal way, and answers any questions. At this point, probably for the first time, the worker is made to realize how large the company contributions to the plan are. Figures for the last two years (company contributions were $4.41 and $4.24 for each dollar contributed by an employee) invariably cause looks of pleased surprise. We feel this informal talk, in which there can be no hint of "management propaganda," gives the new employee a real boost towards an understanding of how important profit sharing is to the employees.

... **by letters to employees.** Ten letters, each explaining one of the main fringe benefits, are sent to each new employee's home. One goes out each week. Our hope here is, of course, that the employee's family will become familiar with, and enthusiastic about, profit sharing and the other benefits.

Turn the page for details on how Motorola maintains employee interest in profit-sharing.

PROF SHARIN, who symbolizes Motorola's profit-sharing plan, shows up all over—in person and on signs and posters. Here he's returning each employee's account book individually after company contributions have been posted.

ELECTION CAMPAIGNS develop spirited interest in profit sharing. Employees vote on representatives to serve on trust fund advisory committee. Candidates go all-out in campaigns, which company encourages as sound way to foster interest.

We maintain interest in the plan...

... **by welcoming the employee as a participant.** After the employee has completed his first year of service, he is eligible to participate in the plan. And so, on his first anniversary, the employee gets a letter from the Human Relations Department welcoming him into the profit-sharing plan, and a copy of the profit-sharing agreement.

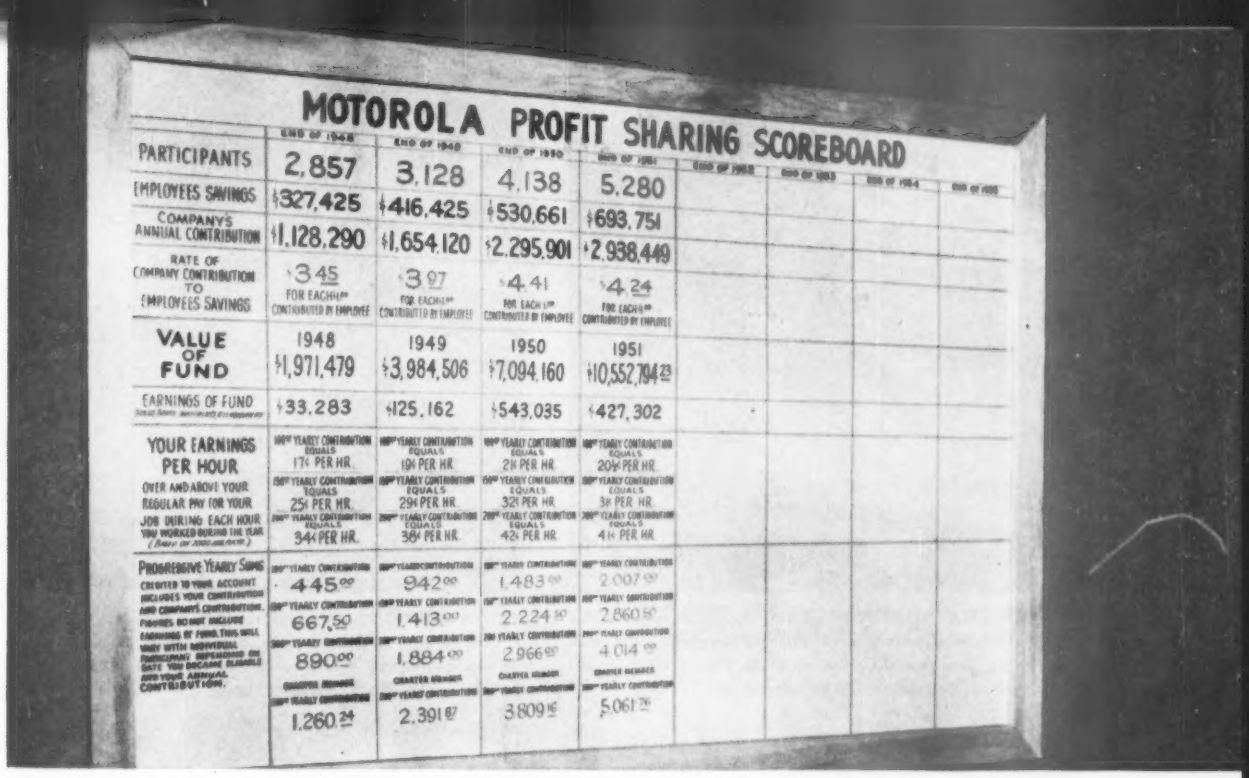
... **by frequent posting of the account book.** Each employee's account book is posted quarterly. Since the company contribution is added to the fund only once a year, we might post the books only once a year. But the more frequent posting makes sense from a maintain-the-interest point of view.

... **by "pulling out the stops" when the company contribution is posted.** On this annual occasion, one of our employees is dressed up as Prof Sharin. He loads the account books for each department on a truck, and pulls them down the production lines, handing each of our more than 8000 employees his book individually. It takes him 3 days, and—there's no doubt about it—disrupts production a little. But it's worth it in terms of driving home to each employee how much money, in actual dollars and cents, he has earned for his future security.

... **by contests.** The amount of the company's contribution is of great interest to everyone, of course. We capitalize on this interest by holding a contest prior to the announcement. The purpose of the contest is to guess how many dollars the company will contribute for every dollar the employees contribute. Contest blanks and an explanation of the contest are contained in an issue of our internal house organ, "Voice of Motorola," about 10 weeks ahead of announcement date. And, of course, there are follow-up articles throughout the 10-week period. Then as soon after the announcement as results can be tabulated, the winners (four guessed the correct figure of $4.24 last year) are notified and awarded their prizes. And we give full coverage in the "Voice" to the winners. Prizes, incidentally, are big enough to stimulate the kind of entry list we want. Last year we offered a console television set, a table-model television set, a clock radio, and a table-model radio as prizes (in the usual order).

... **by maximum publicity of company contribution.** When the company contribution is announced, it gets, of course, front-page, banner-headline treatment in the "Voice." It is spelled out in as many ways as possible. For example, in this year's "big day" issue there were charts showing the company contribution ($2,938,449.46), the total value of the fund ($10,552,794.23), how much an employee would have in his account book if he has contributed the maximum since the plant began ($5,061.76), how much the company contributed to his account ($848 for a $200 employee contribution), how much that amount would be in terms of an increase in hourly pay (41¢) above regular wages.

And small tags giving this same information were hung on the desk or at the workplace of every participant—all 8000 of them.



SCOREBOARD keeps employees reminded of just how profit sharing has been working out. Full yearly data trace progress since inception. Employees also are told just how much the figures amount to per hour, and how rapidly yearly totals grow.

... by a regular column in the "Voice." In every issue there's a regular column that discusses some phase of profit sharing, answers participant's question, etc. The "Voice" also publicizes any changes in the plan. For example, when a provision was made in the trust agreement allowing the men called to service to withdraw their vested interest in the fund, this was covered in a feature article.

... by featuring the plan in the annual report. The employees' edition of the annual report features the profit-sharing totals. Each issue gives a "score card" of contribution and account book values.

... by the president's annual report to participants. At the close of each fiscal year, company president and fund trustee Paul Galvin sends to each participant a letter detailing the "state of the fund." This letter includes a financial statement accounting for the value of the fund, and a list of all investments, giving the interest rate, due date, face value, and market value of each investment.

... by promoting and publicizing election of advisory committee members. The fund is administered by a 5-man advisory committee, and two of these members are elected by the participants. While in no way attempting to affect the outcome of the election, we try to stimulate interest in the campaigning and elections. The president sends out a letter explaining voting procedure and urging each employee to exercise care and judgment in his selection because of his considerable financial interest in the administration of the fund. Bulletin boards are provided for campaign posters. The "Voice" in election-time articles points out the importance of selecting the right men, publicizes the elections by running pictures and statements of candidates, and gives full coverage to results.

... by bulletin boards and signs. A large profit sharing scoreboard is located near the cafeteria door, serves as a daily reminder of earned security. And there are signs featuring the ever-present Prof Sharin in every nook and cranny of the shop. Some of the signs are profit-sharing slogans, but the little professor also shows up on signs urging employees to aim for better quality, less absenteeism, more suggestions, etc. In other words, an attempt is made to tie profit sharing in with everything the worker does.

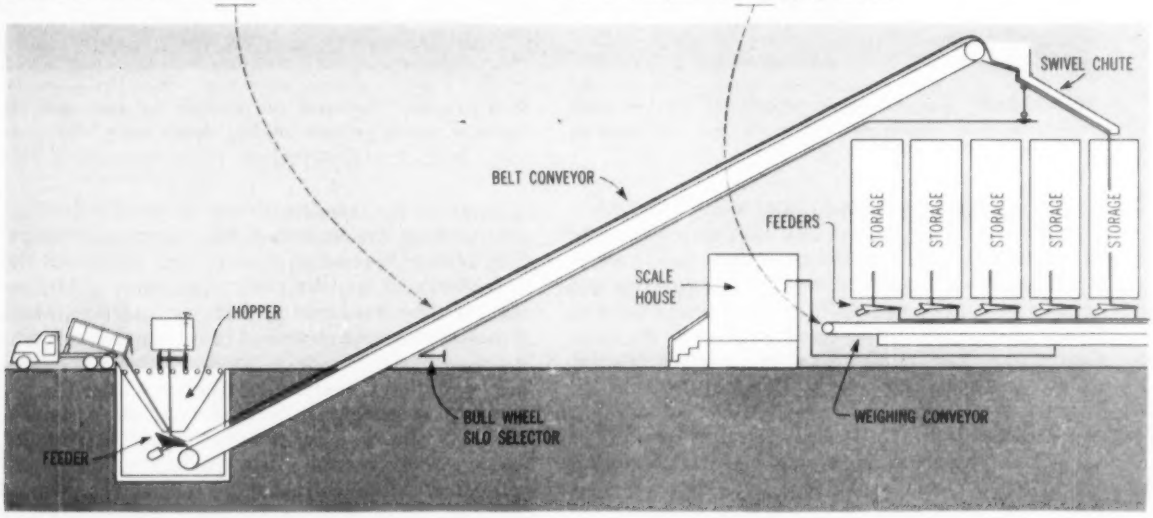
... by audit report to participants. Annually, the auditors of the fund send a statement to each employee's home, telling him the value of his account. Not only does this eliminate "taking the company's word for it"; it also gives us another reminder.

* * *

I think you'll agree, now, that we put a lot of effort into maintaining interest in our profit-sharing plan. It's certain that you couldn't be in our plant for two minutes without knowing we have such a plan. And that's the way it has to be. You have to have a good plan to start with—and then you've got to tell about it and tell about it.

INCLINED BELT CONVEYOR moves materials received by rail or truck from an underground receiving hopper to six storage silos, one for each material. Swivel chute, controlled from the ground, guides material into selected silo.

WEIGH CONVEYOR accumulates a charge, registering weight of each portion as it feeds onto the conveyor. Operator in the scale house controls flow of materials from the silos and transfer of charges into a charging bucket.



INTEGRATED SYSTEM SEGREGATES, STORES, AND BLENDS SIX MATERIALS INTO 1-TON CHARGES. ONE MAN ON NIGHT

Mechanized Handling of Bulk Materials

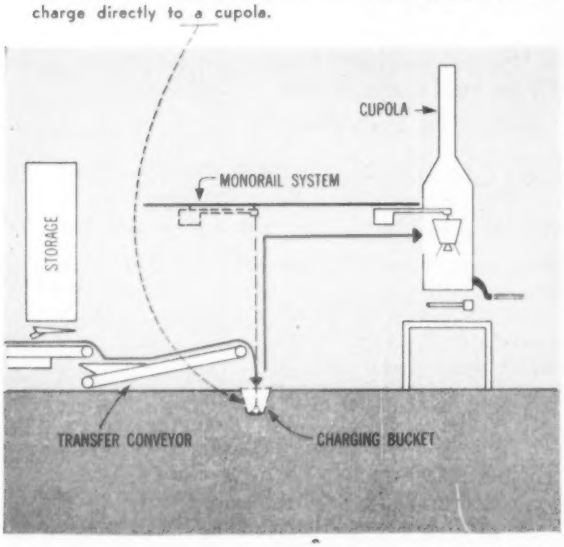
By H. L. HUMES, Vice President in Charge of Production
Baldwin-Hill Company
Trenton, N. J.

"Even though we handle only 4 or 5 cars of raw materials a day, the time came when we could no longer afford obsolete handling methods."

CONCERN FOR THE HEALTH AND WELFARE of our employees was the primary motivation in modernizing our obsolete materials handling system. The men had to do heavy and undesirable outdoor work, exposed to year 'round weather conditions.

The old method of bulk handling approximately 250 tons of raw materials a day was basically manual. Four men per shift—12 per day—moved the materials from stock to cupolas with shovels, wheelbarrows, and an inadequate hoist.

CHARGING BUCKET, bell-bottomed, carries each charge from blending to cupolas. Electric hoist and system of monorail tracks, controlled by operator on the charging floor, move charge directly to a cupola.



SHIFTS, TWO ON DAY SHIFT HANDLE 250-TON TOTAL.

Pays Off in 2 Years

Here's why we decided to change:

- 'Heavy physical labor caused sprained backs and other injuries, resulting in lost time and medical expense.
- It was difficult to get men for a job that required heavy physical exertion in all kinds of weather.
- Complete control of cupola charges was frustrated by the inaccurate weighing of individual wheelbarrow loads. (Solving this problem has considerably improved the quality of the end product —mineral wool thermal insulation.)
- Labor cost was approximately $43,000 per year.

COST AND BENEFITS · Even though we don't handle a really big volume of raw materials—4 carloads a day—we saw the advantages in mechanized handling. So we spent $70,000 to mechanize.

The advantages are the opposite of the disadvantages we had in our old system. Now, one man on each night shift and two men on the day shift handle all the materials with much less physical effort, greater safety, and more accurate control of blends. We figure we will recover the investment in about 2 years.

HOW THE NEW SYSTEM WORKS · We drew on our own experience and the advice of equipment manufacturers to design the installation.

Trucks or railroad hopper cars drop the materials through a grizzly into an underground hopper. Supported from the bottom of this hopper is a vibrating pan-type feeder that feeds the materials to an inclined belt conveyor. This conveyor is 240 feet long, 24 inches wide, and carries materials 300 feet per minute (100 tons per hour) up an 18-deg. incline.

A swivel chute at the upper end of the conveyor guides the materials into a selected one of six storage silos. The swivel chute is controlled from the ground by a bull wheel and cable.

At the bottom of each silo are two chute openings, one for automatic handling, the other for emergency manual operation. A pan-type vibrating feeder under each automatic silo opening discharges the material onto a single conveyor. The vibrating feeders facilitate accurate control of the weight of material taken from each silo to blend a charge.

The materials are discharged onto a belt conveyor, 30 feet long, 36 inches wide, traveling at 150 feet per minute. The conveyor and its drive are supported from a suspension hopper-type scale. An operator in a scale house above the conveyor operates the feeders and conveyor by pushbutton control.

Baldwin-Hill has an idea that the drawing and accumulation of a charge on the weigh conveyor can be done automatically by photoelectric cells. It would improve accuracy even more, and eliminate the need for operator control.

After a complete charge is accumulated on the weigh conveyor it is discharged onto a transfer conveyor—33 feet long, 24 inches wide—that dumps the charge into a bell-bottom charging bucket of 2000-lb. capacity.

An electric hoist, controlled by an operator on the cupola charging floor, lifts the charge. A system of monorail tracks permits the charging operator to move the bucket to whichever of the three cupolas is scheduled for the charge.

IDEAS OF THE MONTH *for*

By LEWIS K. URQUHART • Managing Editor

WITH A NEW PROFILE TEMPLATE called "Adjusto" you can obtain a profile of practically anything. Looks like a handy tool no woodworking or metal-working plant can afford to be without. $19.50 FOB Chicago. Distributed by Duncan-West Corp., PO Box 2092, Chicago 9.

HANDEE OILER is carried like a fountain pen. Delivers controlled amount —from a drop to a squirt. Your maintenance men and electricians will go for it. 89¢. Clover House, Box 1107, Santa Monica, Calif.

OPEN-END RATCHET WRENCH can be introduced from any side of the socket over and completely around a pipe or tube and straight down on the fitting. Then the socket engages nut or bolt and ratchets it off or on as fast as the arm can swing. According to the manufacturer, Tubing Appliance Co., Los Angeles, time studies show savings of 25% to 90% on hard-to-reach jobs in both production and maintenance.

CALL OUT THE VIGILANTES! says Towmotor Corp. (1226 E. 152nd St., Cleveland 10) in its new booklet on "How to Catch Man-Hour Thieves." It's the Hopalong approach to a bonanza of potential savings through better handling. Write for your free copy.

TOWMOTOR will also sell you a steel and plastic scale model of its 480-P fork lift truck. It's 5 inches high with the boom lowered and 8 inches from tip of forks to hind end. $3.50 postpaid. (Sorry we didn't learn about this in time for your Christmas shopping.)

CREPE PAPER, with nearly three times the tensile strength of present industrial crepe paper and black varnished cambric has been developed by GE. Write W. N. Lang, News Bureau, General Electric Co., Schenectady 5. He says it's being used successfully as an insulating tape, and is less expensive and easier to apply than varnished cambric.

FROZEN COAL? Not if you freeze-proof it with Formula 5. Used at mines for several years. Now available nationally. Write Morton Salt Co., Industrial Div., 120 S. LaSalle St., Chicago 3.

NOTE TO INDUSTRIAL RELATIONS DIRECTORS: There's a paper bed sheet on the market, highly absorbent on one side, waterproof on the other. Odorless. Doesn't rustle. Brown-Bridge Mills, Inc., Troy, Ohio.

MM & M HAS THE OPENERS — glass fiber, adhesive-backed ripcords that can be attached to the insides of cartons for quick and easy opening. If the remembrance of your last struggle with a well-sealed carton isn't too dim, you'll appreciate the value of this device. Write Minnesota Mining & Mfg. Co., 900 Fauquier Ave., St. Paul 6, Minn.

POCKET PYROMETER for furnace peepers weighs only 5 1/3 oz., is 2½ in. in diameter, 6½ in. long. Distributed in this country by Allied Engineering Div. of Ferro Corp., Cleveland.

Factory Executives

HINGE-GUARDS protect loads in transporting steel coils, sheets, pipe, lumber, etc. Prevent contact of chain or cable with load. Permit increased chain tension, making loads more compact, less likely to shift. $3.50 per unit. Canton Mfg. Co., 2408 13th St. NE, Canton, Ohio.

HAND-CARE STATIONS near production lines protect workers' hands, save trips to washrooms. Each station consists of a waterless soap dispenser and a wall cabinet of paper towels. Hammons Products, Inc., 2100 Lincoln Tower, Fort Wayne 2, Ind.

FLEXIDUCT is a synthetic rubber solution to your over-the-floor wiring problems. With a tube of cement you're all set. The duct is 2¾ in. wide at the base and rises from a feather edge to an apex of 7/16 inch. Goodyear Tire & Rubber Co., St. Mary's, Ohio.

AMERICAN MONORAIL (13107 Athens Ave., Cleveland 7) initiates a new service to potential users of monorail equipment with a file of "Engineered Applications." It will forward new groups of case studies as completed to all registered holders of the file. Yours for the asking.

BOOKLETS OF THE MONTH are Cooper-Bessemer's (Mt. Vernon, Ohio) Bulletin M-70 on its M-Line Compressors and Dracco Corp.'s (Harvard Ave. and E. 116th St., Cleveland 5) Bulletin 800 on dust recovery and control. Both are outstanding examples of good manufacturers' literature.

TINT-GLASS is a new liquid plastic that cuts down the sun's glare. Easy to wipe on your windows. Comes in green or blue. Can be applied for less than 3¢ a square foot. $13.50 per gallon. Tint-Glass, c/o Roman, 721 Olive St., St. Louis 1.

KILL THAT RESTROOM ODOR with the new Rid-All Electronic Deodorizer. Westinghouse Odorout Bulbs change oxygen in the air to ozone—and ozone burns up odors. $7.50. Abgeon Supply Co., 179-15 Jamaica Ave., Jamaica 32, N. Y.

HANDBOOK OF MANUAL MATERIALS HANDLING EQUIPMENT tells you everything you ought to know about (1) industrial wheels, (2) casters, (3) 2-wheel hand trucks, (4) industrial platform trucks and trailers, (5) pallets and skids. All for the price of $1. The Castor & Floor Truck Mfrs. Assn., 27 E. Monroe St., Chicago 3.

BALL-POINT TUBE is what caught our eye when we saw the announcement (by John P. Nissen, Jr., Co., Glenside, Pa.) of a new permanent marking ink —for castings, bar stock, machines, etc. Six colors.

BEST BOOK we've seen on the hot subject of "where do wages come from" is Eddy-Rucker-Nickels Company's "Progress in Productivity and Pay." Our book review editor says, "It's a gold mine of statistics on manufacturing . . . a reference *must* for every executive." To learn more, see page 304.

REPORTING STATIONS, are located in each department. Employee "dials out" at finish of job, gets instruction for next.

CENTRAL RECEIVING STATION is in center of semi-circle of schedule boards. Operator maintains all job-time cards, can receive six calls at one time. Each scheduler has intercom for exchange of additional information with departments.

ULTRA-FAST COMMUNICATION . . .

. . . is key to effective centralized production control. It reduces waiting time, shortens manufacturing cycles, lowers in-process inventory (at 80¢ an ounce).

By CARROLL W. BOYCE • National Affairs Editor, FACTORY

CENTRALIZED PRODUCTION CONTROL and dispatching —to a plant that has never had it—is a bit like a wild mustang. Tough to saddle-break; but a valuable animal once mastered.

Towle Manufacturing Company (silversmiths), Newburyport, Mass., has made the change. Successfully. Plant Manager Earl Havener doesn't pretend that the transition was all smooth going. Or that the system can't be further improved.

But the annoyances of the change-over were a small price for the results that have been achieved:

• **Manufacturing cycle time is expected to be cut about one-half, on the average.** Priority jobs can now be put through in 15 days or less—compared to the old average of 2 months or more.

• **In-process inventories have been cut substantially.** That's part-and-parcel of the reduced cycle time. But it's particularly important when your raw material is sterling silver at 80¢ an ounce.

• **Advance scheduling and loading of machines means that tools and dies can be delivered to the operator with the work.** "Waiting for tools" used to be a big time-consumer for skilled craftsmen. Now the tool crib or die room is notified in advance exactly what will be required for work scheduled on a given day. The tools are automatically sent to the work station, and are immediately available when the work is assigned.

• **The plant manager—and the foremen—can get an accurate picture each morning (or at any other time) of the status of all work in the plant at that minute.** All it takes is a glance at the loading boards in central production control.

Most foremen drop in every morning for a look-see. This procedure has virtually eliminated the old problem of Department B becoming unbalanced because Department A foreman was "pushing" the wrong orders. By seeing the whole picture, the foremen can understand why work is loaded as it is —that the whole business isn't just arbitrary.

• **Foremen have more time to spend on "constructive" work—methods improvements, on-the-job training, personnel relations, and truly "managing" their departments.** Havener believes that, long-term, this may be the biggest single advantage of the new system. The foremen I talked to were enthusiastic about the opportunity it has given them to broaden the scope of their activities.

To test your reading ability . . .

Read this article at your normal rate of speed for general information. For test purposes, do not examine pictures or read captions.

Record your exact reading time in minutes and seconds. Then turn to page 284 and answer the questions based on the article.

The "secret" of the centralized scheduling and dispatching system, according to Production Control Manager Willard Charles, is fast, 2-way communication. It's provided by a combination of a Temporator network plus an Executone intercom system — known as "squawk boxes."

Fifteen Temporator reporting stations—most of them in soundproof booths—are located in the departments throughout the plant. The receiving station is at the center of a semi-circle in the production control office. Taylor-type loading boards are on the walls that comprise the circumference of the semi-circle. Each of the three schedulers on the loading board has his own squawk box.

NEW SET-UP • STAGE 1

Before adopting the present combination, Towle gave a lot of thought to using either the Temporator or intercom system alone. The easiest way to see why the final solution was the combination is to look at how the system might have operated with just the Temporator.

Broadly, the Temporator "reporting" units look like a combination of a telephone dial and 12 "totals" windows of a non-printing adding machine. As each digit is dialed, it appears simultaneously in the windows at the reporting station and at the central receiving station. At receiving there are six banks of 12 windows each. That allows the operator to receive up to six calls at once.

When an employee completes work on a particular order, he goes to the reporting station. He dials his clock number, the order number, and the number of pieces completed.

At the receiving station, a girl types this information on a time card, and then time-stamps it. (These cards serve as the basis for computing payroll, and also for product cost analyses.)

After the Temporator operator has filled out the card, she passes it to the scheduler responsible for the employee's department. He then checks the job out, and reports to the operator the order number for the employee's next job.

She dials the employee's number and the order number. This appears at the reporting station, and is his signal to start on the next job. At the same time, the operator enters this information on a card and time-stamps it.

When the system was tried on this basis—with the Temporator only—certain advantages and disadvantages showed up at once.

THE ADVANTAGES

• **The receiving unit can handle six calls at one time.** This practically eliminates "busy lines," saves time of shop personnel. It removes the age-old excuse for non-reporting: "I couldn't get through for instructions, so I just started on the nearest available job."

• **There's no chance for misunderstanding verbal reports.** When the employee dials in, the digits show up on his sending station. That gives him immediate confirmation that his report is correctly filed. Shop noise can't garble messages. It is, however, still possible for the receiving operator to transcribe digits incorrectly. But such an error is too infrequent to justify the expense of attaching an automatic printer to the Temporator.

THE DISADVANTAGES

• **Messages are limited to 12 digits.** That will handle most routine calls, but it was necessary to devise a code system to transmit supplementary information. Codes were awkward to handle, especially for shop personnel, and brought in the possibility or error either in coding or decoding.

• **"Discussion" with the shop and transmitting information on unusual situations was difficult if not impossible.** Result was that schedulers did not have a really complete picture of what was going on in the departments.

NEW SET-UP • STAGE 2

To retain the advantages of the Temporator and at the same time overcome the disadvantages, the squawk box was installed as a parallel system—actually three systems of squawk boxes.

Each of the three schedulers has a master box through which he can talk directly with any operator in his division.

Under the present system, when the employee calls in, he dials his number and the number of pieces completed. (Dialing the order number was eliminated since this was recorded on the time ticket when the job was started.

The Temporator operator enters the information on the time ticket, as before, and simply calls to the scheduler (no more than 5 feet away) the number (or, usually, the name) of the reporting employee.

The scheduler switches on his box to that reporting station. He then tells the employee verbally the number of the job he is to work on next.

If, at this time, the employee has any questions about his part or future assignment, all he has to do is speak up. The scheduler can usually straighten him out in a matter of seconds.

The Temporator operator hears the scheduler's directions to the operator and fills out a new time card, with employee's clock number, job number, number of pieces, and time stamp on it.

At the close of each day all cards are checked out and new cards are made up for the same orders, with time beginning the following morning.

If any employee fails to show up, the foreman notifies central receiving, and the card is withdrawn until the employee appears and personally dials in. (Depending on state regulations regarding timekeeping procedures, you might use this set-up in place of time clocks in the shop.)

HUMAN ENGINEERING: What it is and what it can do for you

By JACK W. DUNLAP • Dunlap and Associates, Inc., Stamford, Conn.

Here's a run-down on what you need to know about a new profession and a new tool of management—born of the wedding of industrial engineering and the sciences of psychology and physiology.

If you haven't graduated yet to human engineering—the science of man and his workplace—you will have to soon. The more you mechanize your production—the more you progress toward that "factory of the future"—the more you'll need human engineering to help you make the adjustment. Now's the time to start getting the story. And here it is—by one of the pioneers in the field.

What human engineering is

Human engineering is the designing and laying out of equipment with the abilities and limitations of the human operator in mind, to get the greatest efficiency in the "man-machine system."

Human engineers apply, in a systematic way, the knowledge and techniques of fields such as psychology, physiology, industrial engineering, and probability statistics. They aim to design equipment that can be operated easily, quickly, accurately, and safely.

"Human engineering" *vs.* "work simplification"

Both human engineering and work simplification are concerned with the man-machine relationship. Differences between them are likely to be mostly differences in emphasis, such as:

1. Work simplification frequently stops with the simplification of the job, without considering the effects on the operator and the broader implications for other departments. The result may be that the job is over-simplified or automatized to the point where employees lose interest, morale is affected, or turnover rate goes up.

Human engineering considers the man-machine as part of a larger system. It regards the "work environment" in somewhat broader terms. Thus, a human engineer would study a "man-machine unit" in relation to other units, other departments, and ultimately the factory as a whole.

In other words, a human engineer would not stop with a study of a specific machine and its immediate work area. He would cover the layout of units in the space, lighting, ventilation, and noise, the flow of materials within and between departments, and the communication requirements—including both inter-coms and visual indicators. Further, he would study these factors not just for their effect on output. Their effect on employee satisfaction, relations between departments, and over-all efficiency is equally important.

It would be valueless, for example, to increase the output of the production department if the inspection department could not be geared to handle the increase. Nor would it be efficient to increase production and inspection capacity if sales could not be expanded proportionately.

2. The second difference between human engineering and work simplification lies in the

approach to the problem. The human engineer brings to bear a systematic body of knowledge about many aspects of human abilities and limitations. This knowledge is based on controlled experiments on large samples of individuals. It pertains to such things as: visual acuity and perception, ability to perform manual tasks, intellectual capacity, motivation, ability to make judgments, critical body measurements, and ability to withstand radical changes of temperature. Knowing the norms and the variability in the population regarding factors such as these permits the creation of a work environment which fits the machine operators. Furthermore, if the human engineer lacks data about a specific situation, he can perform the experiments necessary to get the answers.

Examples of human engineering at work

1. INDIVIDUAL WORKPLACE ENGINEERING • The first production step in a factory that filled orders on a custom basis was to translate customers' orders into coded form for use by manufacturing and inspection departments. Learning time for the technicians who performed this task was from two to five years. It was a rare individual who could handle all types of orders. Naturally, management was anxious to reduce learning time and to increase quality of performance.

One approach was to improve the technicians' equipment, which consisted principally of a set of information tables. These tables varied in size, color, lay-out, and organization, and were not arranged in any systematic sequence. Some were hard to read from the standpoint of legibility, meaningfulness of material, and amount of reading required. Habits required for reading one table could not be applied to other tables.

Human engineering techniques applied to the improvement of this equipment resulted in:

Markedly reducing the number of charts.

Individual charts which were easier to read and understand.

Standardization of chart size, layout, and organization.

Making available information that was not previously available in writing and existed only in people's minds.

Use of this human engineered equipment made possible:

Faster learning of techniques.

Lowered selection requirements.

Fewer errors in specifications.

Fewer consultations between technicians and production manager.

2. INSTRUMENT PANEL ENGINEERING • A large power plant, equipped with a series of motors and generators, is operated primarily by one man. The control panel, which originally was positioned vertically to the left of the operator, was redesigned as a console and placed horizontally in front of the operator. All switches were placed within 30 inches of the operator.

Control sticks were redesigned so that continuous rather than discrete control was possible. Control sticks were friction loaded to a maximum of 16 ounces at the tip so that the sticks returned to a neutral position when released. This frictional loading caused the operator to exert a positive force during operation, but it was not great enough to be fatiguing over an 8-hour shift.

In this case, human engineering reduced operator fatigue by eliminating the need to reach for switches. Operator efficiency was increased by utilizing continuous control, permitting exact settings, and by frictional loading of the sticks to insure positive control without excessive fatigue.

3. VISUAL INSPECTION ENGINEERING • A company manufacturing tapered roller bearings was having trouble retaining skilled female inspectors. The job was difficult and fatiguing because the inspectors had to examine the side and bottom surfaces of the moving rollers for seven different surface defects. These rollers were presented to the inspectors by a machine at a rate of 49 per minute.

Examination of the workplace revealed that certain changes might improve the quality of inspection and make the task easier for the operators. An experimental study was designed in which lighting, work period, classification of defects, speed of presenting rollers, and contrast of the machine with the rollers were varied.

Special coded lots containing approximately 10% defective rollers were inspected. The best conditions of illumination, length of work period, classification, speed, and conditions of contrast were identified. It was found that with constant usage, the parts of the machine that delivered the rollers became bright and shiny. The rollers were bright and shiny, too, so it was difficult to differentiate between roller and machine background. This situation was corrected by coating the machine with a deep, low-reflecting black. Inspection improved markedly with the higher contrast.

• Similarly, in a pharmaceutical company the number of pills per bottle was checked by an inspector who poured the neutral-colored pills out of the bottle onto a small wooden paddle containing a number of holes. When all the holes were filled, the bottle contained the correct number of pills. Unfortunately the contrast level between the pills and the holes in the paddle was so low that often the inspector was unable to tell whether or not the hole contained a pill. This situation was easily corrected by coloring the bottom of the hole orange. This made empty indentations easily distinguishable.

Turn the page

Mistakes that human engineering can correct

Here are some specific examples to show how human engineering can be applied:

- **Chairs at workbenches.** Usually not adjustable for height, etc. No arms. No adequate footrest. Inadequate back support, if any. Seat too small. Result: uncomfortable, fatiguing. Output of worker affected.
- **Chairs and support** for special working situations (under airplane wing, top of trailer, etc.). Not provided. Worker must kneel, bend, twist, or stretch without adequate body support. Very fatiguing. Quality of work suffers greatly and worker output drops.
- **In injection molding,** pellets to be heated and melted into fluid plastic must be poured into machine from its rear, top. This requires climbing ladder with heavy bag of pellets. Slow, unsafe, fatiguing. Lower and redesigned pouring point would aid.
- **Fork trucks** used in materials handling. Lift attached to front of truck sometimes obscures vision of operator. Unsafe. Need redesign of lift to provide better view of roadway and working area.
- **Lathe, milling machine, other machine tools.** Controls which must be used simultaneously are frequently widely separated, requiring great stretch by operator. Controls sometimes so located away from work table of machine that operator cannot easily see what is happening on work table when operating controls. Drill chucks, etc., are sometimes in operator's line of sight to piece on work table, obscuring piece. Not comfortable; fatiguing. Lowers effectiveness and accuracy of work.
- **Plastic embossing press.** Safety switch to stop downward movement of upper jaw in out-of-the-way, hard-to-reach location. Dangerous. Need is for more and better-located switches.
- **Fluid control valve** in chemical manufacturing plant. Wheel-type valve control difficult to turn because of high resistance and diameter that doesn't fit hand well. Slow, fatiguing, may lead to hand bruise. Needs study of proper resistance and design of wheel control to fit hand.
- **Gages (dials)** on control panels. Types, scale divisions not good. Slow, difficult, inaccurate to read. Would help to use check-reading type dials or danger-signal indicators, fewer scale divisions.
- **Drill press.** Lever for hand feed requires long reach. Work table not at best height for unobstructed view of work. Need convenient work lever, properly placed work table.
- **Heat sealing press.** Gives off considerable heat toward front. Uncomfortable, tiring. Need to shield press, reduce forward movement of heat.
- **Machine and workbench lighting.** None, too little, or even sometimes too much. Lighting too direct. Glare present. Need to determine correct amount of light for job type; for example, more needed for inspection than for materials handling in aisles.
- **Plastic-cutting machine.** Cutting blade location somewhat obscured, difficult to determine how far away to keep hands. Need to provide safety cues, indicate blade danger area better.
- **Inadequate space between personnel** working at workbench and at other equipment. Important to minimize distances for materials handling and other purposes, true; but it is also necessary to allow adequate space for movements required by job, adequate space for workers to climb onto their chairs without disturbing adjacent workers. Need: to base space allowance between personnel on body measurements, movements required by the job, and peculiarities of the job.
- **Inadequate space between equipment and in aisles** for fast, safe traffic movement. Spacing and aisle widths, etc., should be based on traffic studies, body-size measurements, nature of equipment passing through, etc. Use of "standard figures and allowances" sometimes not wise.
- **Poor location of personnel:** Over- or under-heated areas; humid, under- or over-lighted, dirty, or odorous areas, near lanes of disturbing traffic. Result: discomfort to worker, faster fatigue, lower quality and quantity of output, greater accident tendency.
- **Poor grouping of workers.** Design of workplace puts workers where motions or other activities in work distract or disturb workers facing them (or adjacent to them). Need: to locate workers in groups so the motions or activities of one will not disturb the effectiveness of others.
- **Poor location of visual displays** (dials, instrument panels, control boards, etc.). Often located too far from user, so that they cannot be read accurately or rapidly. Need: to base location of displays on human visual ability, within easy reading range.

How far can you go with human engineering?

This is an important problem. Here's the way one practical executive put this question to us: "Has human engineering ever been used in industry to find the optimum point in employee comfort—to keep you from having him so comfortable he goes to sleep?"

To a certain extent this is an academic question, inasmuch as many industries have not as yet es-

tablished *acceptable* employee comfort, let alone optimum comfort. However, there are a few interesting examples which suggest significant possibilities for the future. The human engineer would look upon this problem as essentially one of *motivation.*

• An example that comes closest to answering the question is the use of sodium vapor lights on highways. Such lights have resulted in lowering accident rates. The explanation is not that they give better illumination, but that, because they are *different*, the driver pays closer attention.

• One company got an increase in productivity by *defying* the laws of motion economy. Employees had to go *out of their way* to obtain working materials, obtain a drink of water, etc. Possible interpretations of the improvement are that monotony was reduced, or that fatigue was reduced by giving certain parts of the body a chance to rest.

• A study done at IBM attributes improvement in job interest to *job enlargement*. For example, a production worker does his own set-up and inspection work, whereas set-up and inspection work were formerly done by other people.

• A pharmaceutical house and a garment factory obtained an improvement in job interest and work performance of production workers by a training program which included work in *other departments*, particularly inspection.

• A rubber goods factory was faced with the problem of determining the optimum speed of the conveyor belt. Too slow a speed would spoil the product from a purely chemical standpoint. Too fast a speed would bring worker criticisms of "management speed up." An experiment was performed in which the operators of one group controlled belt speed themselves, and those of another group had belt speed controlled by an engineer. The operator-controlled belt group had higher productivity with satisfactory product quality. Explanation: reduction of speed-up threat, enhancement of feelings of self-worth, and adjustment of speed in accordance with feelings during various parts of the day.

What can you do about human engineering?

Does a plant executive have to have a staff of experts to put human engineering to use? Can he train his present people, or have them trained for him? Or should he plan to call in specialists regularly—or when problems arise?

These are questions we often hear these days. Here's how we feel about them:

Much of human engineering is plain common sense. To this extent an intelligent, practical man, given the job of running around a factory and improving the design of equipment in its workplace and making it easier to operate, will help.

But our practical friend is going to have two difficulties. One he will run into; the other he will never know about. The first is that often he will not know enough about the abilities of man to solve his problem. The more important difficulty is that he will, through his ignorance, fail to make a lot of improvements which could be made. Or he may even apply solutions which make things worse. So he had better have a real expert, at least now and again.

Of course, the practical man can have his present people trained. But he shouldn't forget that the average specialist in human engineering has spent five to seven years in college and another three or four in industry. Can he afford that length of training? Very big corporations can, but little ones obviously can't. Maybe he will have an under-employed psychologist about the place who could take a course in human engineering.

Any human engineer who spends his whole time in one industry is usually going to solve the problems posed to him a lot more quickly and cheaply than an outside consultant would. But the outside consultant, because of his freshness of outlook and broader background, will often see problems that are too big for the factory's own expert to see at all. And sometimes the consultant will solve problems quicker, too, because of his wider experience.

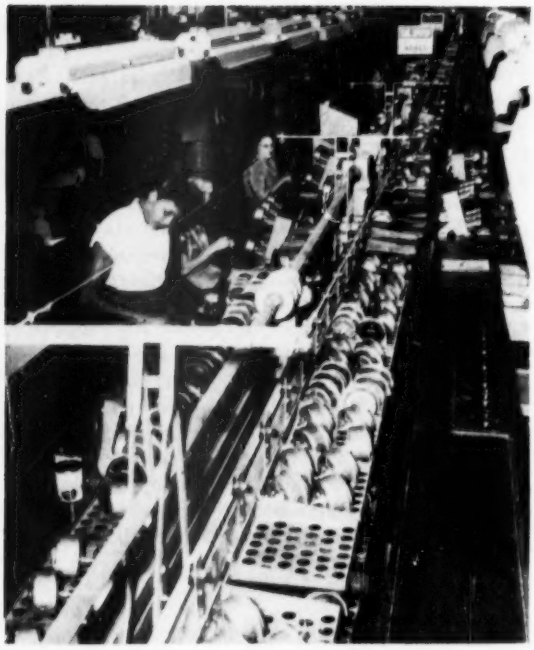
It is probably a good idea to have a specialist come in either regularly or when a change is being considered. Once a problem has arisen, it means that a piece of hardware has been built and its alteration will cost a lot of money. It is cheaper to make the alteration in the blueprint stage.

There is no good book on human engineering in the manufacturing industry because so far there hasn't been enough human engineering to write a book about. Most human engineering has been done in situations where a man has a very complex job—for example, in submarine and aircraft —and most of the literature deals with such applications. An excellent book on these applications is Chapanis, Garner and Morgan's *Applied Experimental Psychology* (John Wylie, New York 1949).

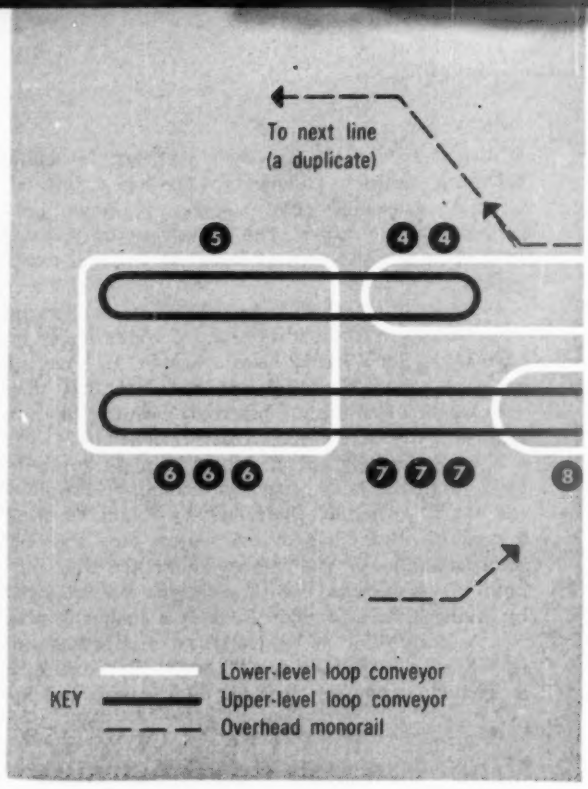
However, as mechanization of industry reaches new high levels, the task imposed on the man is increasing; and the cost of errors, delays, and breakages is going up. So, industry's need for human engineering is developing fast—as is interest in the field.

CORRECTION: We omitted the square root sign in a formula for quantity of production (FACTORY, November 1952, p. 139). Sorry. The formula should read:

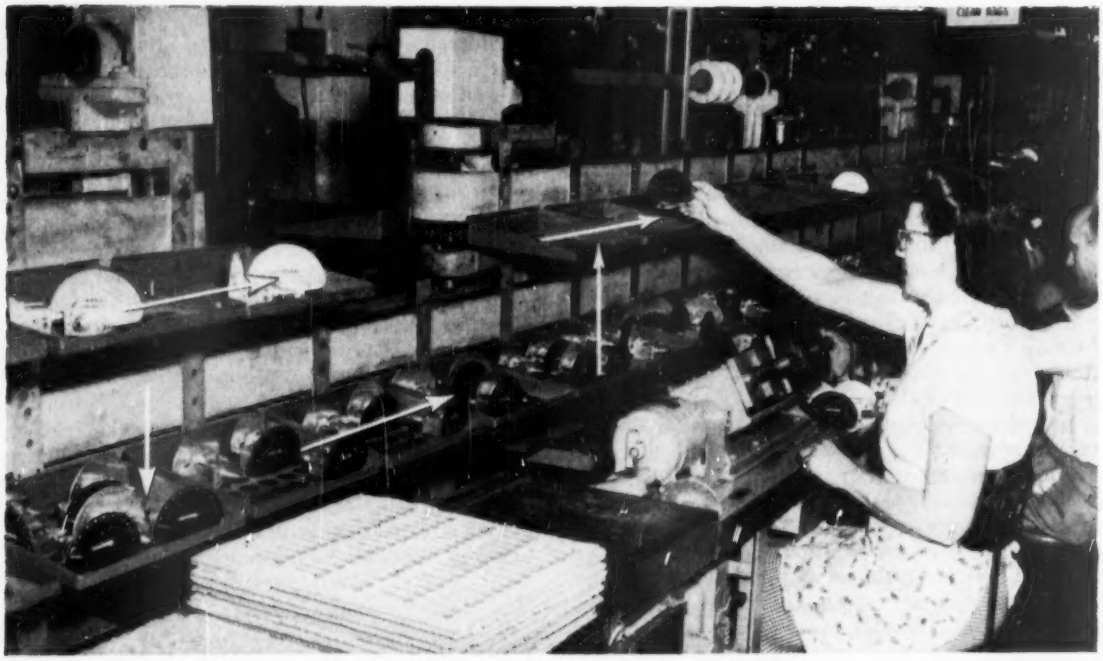
$$\text{Quantity} = \sqrt{\frac{2 \times \text{Annual Consumption} \times \text{Set-Up Cost}}{\text{Interest Rate} \times \text{Cost per Piece}}}$$



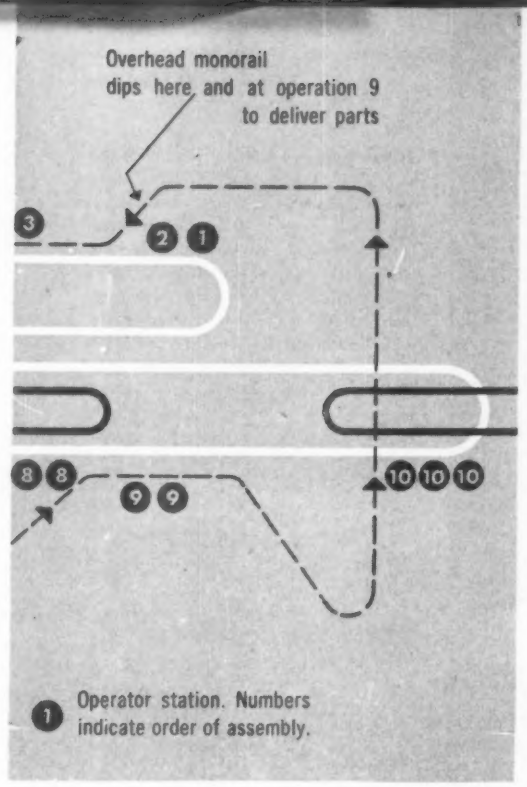
MERRY-GO-ROUND looks like this when viewed from end of line. No clutter. No harm if operator misses a part. It gets another ride and is picked up next time.



LAYOUT OF MERRY-GO-ROUND CONVEYOR • All operations shown are assembly. Not shown are three upper-level and three lower-level loops that serve operators who calibrate, inspect,



TOP-TO-BOTTOM, bottom-to-top handling principle is illustrated here. Operator who adds needles (off picture, at left) takes work off top loop (at left, only two trays visible), puts finished work on lower loop. Next operator, a calibrator, takes work off lower loop, puts finished work on upper.



run dials back to 0, and pack. All loops rotate counter-clockwise. Stations have from one to three operators. Extra operators can be added at any station to balance assembly rate.

SOME PARTS are moved to work stations by monorail. Others —small, delicate parts like pointers and hairsprings—are delivered by tote box. Since a day's supply can be carried in a box, cost of a supply conveyor is not justified.

Merry-Go-Round Conveyor Speeds Assembly

No delays between operations, no clutter, no crisis when assembly worker is absent.

By D. C. PETERSON • Director of Manufacturing and Engineering
Stewart-Warner Corporation, Chicago

FOR SOME TIME we assembled speedometers (for autos, trucks, motorcycles, bicycles) on long benches. As each operator finished her task, she'd push the part (or a pan of parts) down the bench to the next work station. The line was usually cluttered. There were often delays between operations, which meant delays farther down the line. Not too uncommon a trouble, I'm sure you'll agree.

So we developed the merry-go-round conveyor. The diagram and photographs will explain its operation. But here are some of its features that should be emphasized:

1. The line is extremely flexible. We make about 50 different models, all on this same line—with no changes in the line itself. There are usually several different models on the line at any one time.

2. We've eliminated delays and "temporary storages" between operations. And the clutter of tote pans and trays is gone.

3. An operator need not finish a job in a fixed time. An operator can take as long as she needs to do her job correctly—whether it's assembly, calibration, or inspection. Say an operator has trouble calibrating an instrument. She takes three times as long as she normally would. Succeeding assemblies don't pile up in front of her. They just keep riding around the conveyor loop until she is ready for them. On the other hand . . .

4. The line is self-policing A pile-up of parts on any loop of the conveyor is an instant signal to the line foreman that there's trouble. He can then take corrective action—usually by shifting another worker to this work station.

5. Both conveyors at each station—the one for incoming parts and the one for outgoing parts—are within convenient reach of the operator.

6. The line can handle any volume of assemblies—from a mere trickle up to the maximum of a fully loaded line—by adjusting the number of assemblers at each work station.

$5000 COLD CASH. That's really the hero of Myers' "lay it on the line" demonstration. Here Controller M. C. Moses counts the money out on demonstration table in front of 140 company old-timers. Moses has just made a dramatic entry into meeting hall, carrying a bulging money sack, and accompanied by a uniformed guard (for effect). The $5000 is a nominal sum, representing an average annual wage that has some impact for the group. Purpose of meeting is to ask volunteers to count out cold cash that represents their tax payments.

VOLUNTEER HARRY BURGMAN (left) gets the $5000. He counts the money as Moses passes it along, and makes running comments about what he could do with all that money. Bills are in denominations of $100, $50, $20, and $10. Burgman, besides being a 25-year man, is president of the union at Myers—Local 1297, International Association of Machinists.

ECONOMIC EDUCATION:

New Way to Tell Workers About Taxes

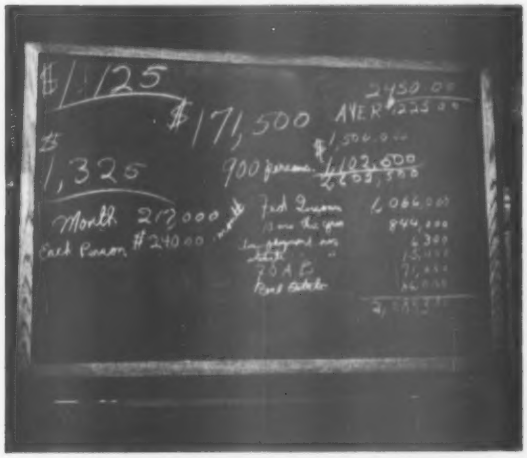
There have been lots of efforts to get the real story of the impact of high taxes across to workers. But FACTORY's editors have never seen a method that has the dramatic, personal impact of this one.

Our camera caught the premiere of the new technique's presentation in Ashland, Ohio. Occasion was a meeting of The F. E. Myers & Bro. Company's Quarter Century Club.

Want to do something similar in your own plant? These pictures will give you the basic story. You can get additional help by writing to Group Attitudes Development Corporation, 500 Fifth Avenue, New York 36. They've published an informative booklet, titled "Lay It on the Line." This is the booklet that Myers used as a guide in setting up its program.

NOW BURGMAN IS LAYING THE CASH on the line. Controller Moses has just asked him, "How much real estate tax do you pay?" And here he puts down $20, explaining he has only a small piece of property. The money goes in front of a prepared show card marked "real estate tax." He has already plunked down another $30 for gasoline tax. And next he'll lay out $100 for taxes on the cigars and cigarettes he and his wife burned up during the year. Burgman actually recalls only the miles he drove and the number of cigars and packs of cigarettes smoked during the year. Controller Moses figures out the tax for him.

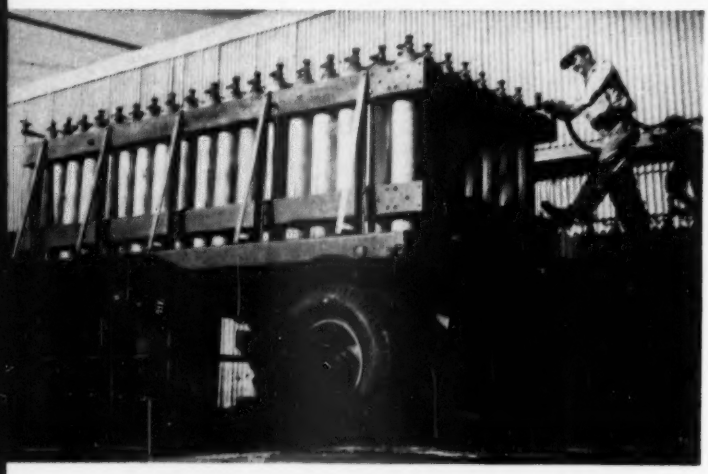
TOTAL $1325. That's what Burgman's picking up now—the sum of 13 major direct taxes he has paid, as indicated by the long line of cards on the demonstration table. Some examples: $170 for luxury tax; $252 excise tax on his new car and accessories; $30 for Ohio state sales tax; $30 for admission tax; $10 for communications tax. By this time audience interest is at a high pitch. And so is Burgman's. That $1325 feels and looks good to him and to everybody else. Handling real cash this way puts wallop into the demonstration.



WHAT THE WHOLE PLANT PAYS IS NEXT. Here's the combined total for all Myers employees, plus the company's own tax payments. On the left you'll see Burgman's $1325 and another figure of $1125 for a second volunteer—Methods Engineer Royal Sigler. The average of these two figures is $1225. For the 140 old-timers present, that means a tax bill for one year of about $171,500. For all 900 employees, it comes to $1,102,500. Then Controller Moses adds the company's taxes of $1½-million. Total is more than $240 per month per employee.

"FIGURE IT OUT FOR YOURSELF," invites Vice President Harry Myers. He distributes special kits members of the audience can take home with them to figure their taxes. Kits come in big envelopes, contain $5000 in stage money (called "Big Tax Money"), a 3-page instruction form, two blank sheets for figures, and a pencil. Next to see the demonstration will be union officers, stewards, and supervisors, then all the rest of Myers' employees. Employees will be asked to talk up the problem of the growing tax bite at lodge and union meetings, and to write their Congressmen and local newspaper editors.

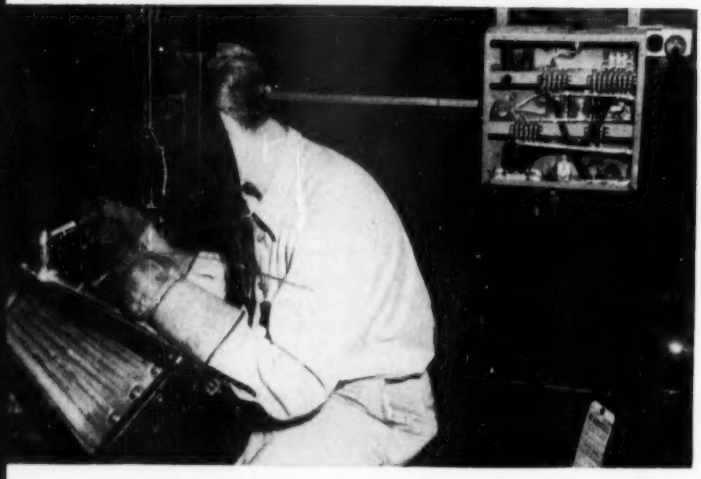
OPERATING SHORTS



Trailerload of CO_2 Is Fire Insurance

This parked trailer holds a standby supply of inert carbon dioxide gas for fire control at Reichold Chemicals, Inc., Elizabeth, N. J. It's ready for use in case the plant's regular CO_2-manufacturing unit breaks down.

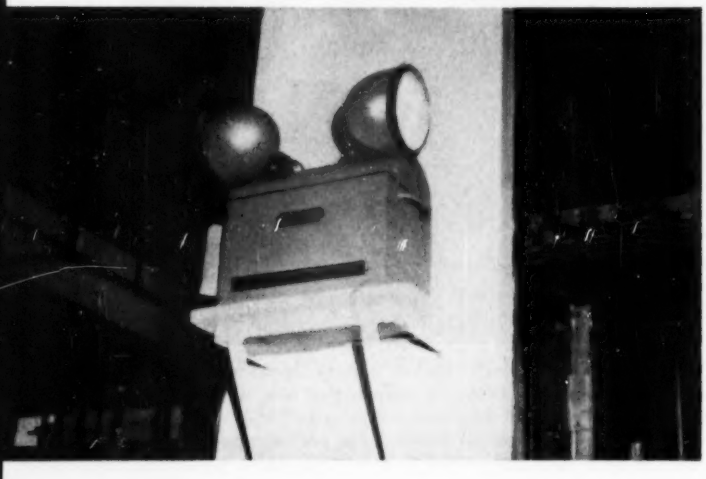
There are 126 cylinders of CO_2 on the trailer, parked outside a building where synthetic resins are produced. The photo shows a worker connecting the trailer manifold and CO_2 supply line with a flexible hose. Opening valves at the manifold and on a cylinder starts the standby supply flowing.



Timer Expected to Cut Gas Bill by 32%

A $38,000 slice off its $120,000 annual bill for argon gas—that's what Ryan Aeronautical Company, San Diego, Calif., foresees from using a new automatic timer at 84 manual heliarc welding stations. The timer (on wall behind welder) stops waste of gas and water.

Gas and water use is controlled by microswitch in foot control of operator's generator field rheostat. This starts timing sequence that turns on, then automatically cuts off gas and water 8 seconds after operator breaks arc. The 8-second delay is necessary because tungsten electrode must cool below oxidizing temperature to avoid deterioration.



Lights Shine When Power Fails

Sudden blackouts are prevented by battery-powered emergency searchlights at The F. E. Myers & Bro. Company, Ashland, Ohio.

Failure of the regular indoor lighting circuit automatically turns on the searchlights. Otherwise, they're never used.

The lights are spotted over key aisles in the plant and offices. Myers says they're valuable to watchmen, firemen, and rescue workers in case of burglary, fire, or disaster.

Mobile Tool Box Easy to Handle

Mobile tool boxes aren't new, but this one stands out because it has a "place for everything and everything in its place."

Small, compact, and easy to get at, it was designed and built by A. J. Baker, Maintenance Department, National Supply Company, Torrance, Calif.

Two wheels and convenient handles make it easy to push. At a job, it stands firmly on three feet. It's fitted out with C-clamps, several kinds of wrenches, a level, a flashlight, and other millwright's gear.

Piping Air From Bags Helps Fill 'Em

It took a Hero to solve a knotty problem at the American Cyanamid Company's Warners Plant, Linden, N. J.—how to vent excess air from heavy export bags while filling them with aluminum sulfate.

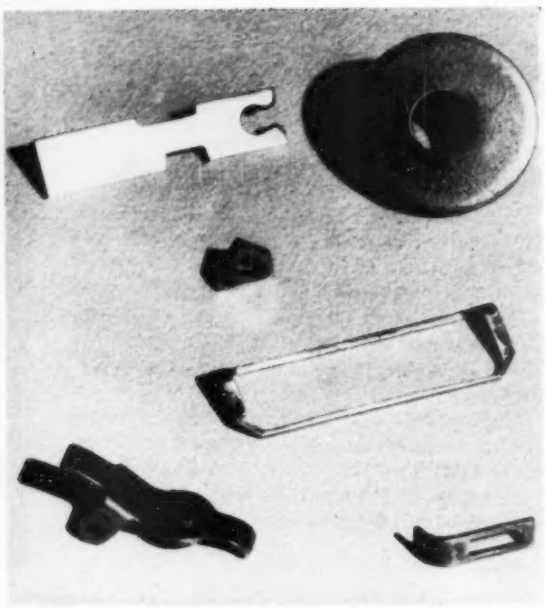
This solution won a $500 suggestion award for Joe Hero, a packaging machine operator: Attach a pipe just above the spout that pours sulfate into bags. The pipe acts as an air-escape vent, makes possible a stronger, tighter package. It works well with granular materials heavy enough to drop to the bag's bottom but not with powders. Photo shows 2-spout machine, with one bag being filled.

Converted Plant Truck Fights Fires

Here's a self-powered fire truck that travels everywhere and rides elevators in a multi-story, multi-unit plant. It was converted from a standard electric industrial truck by maintenance personnel at the Edgewater, N. J., Works, Aluminum Company of America.

Manned around the clock by a crew of three, it carries complete fire fighting equipment, including hose, CO_2 cylinders, extinguishers, pumps, ladders, tools, auxiliary aids, and personal gear. Extensive aluminum construction reduces its weight. Among other units tried by Alcoa were gas, battery, and hand-pulled trucks—and even a jeep.

SMALL ROUGH STAMPINGS LIKE THESE GET . . .



. . . FINE FINISH LIKE THIS IN SLIDABRADING BARREL.

SLIDABRADING—a faster, cheaper way to precision-finish small parts

By RICHARD DE PASTINA • Manufacturing Engineer, Headquarters Manufacturing Engineering Department
Westinghouse Electric Corporation, Pittsburgh, Pa.

What's slidabrading?

It's precision tumbling—a practical way to remove burrs or fins, polish and buff surfaces, and apply radii to edges. It works well at Westinghouse with a wide variety of metal and plastic parts. Replacing hand finishing, for instance, it has boosted production by as much as 470%, chopped direct labor costs as much as 97%.

Conventional tumbling is, of course, neither new nor news to industry. For more than 100 years, parts have been finished in revolving barrels. But early methods provided little abrading action, allowed no precision work, and produced no fine finishes. Even relatively recent methods left plenty to be desired—they didn't control variables, didn't protect parts from nicking and scratching.

Slidabrading makes molehills out of those mountainous drawbacks. That's because it controls variables so that parts "slide" or "float" in an abrasive mix and normally don't drop while the barrel is turning. This sliding action—plus the fact that the barrel is lined with rubber or wood—prevents nicking and scratching.

Abrading action is concentrated on exposed, sharp edges. Action on flat surfaces removes little material, but smooths the finish. Because parts are suspended in the abrasive mix, you can slidabrade fragile, as well as heavy, sections.

What to slidabrade

You can slidabrade almost any metal or plastic part if it weighs no more than 12 ounces and if burrs aren't more than 0.010 of an inch thick. It's even possible to slidabrade heavier parts by fixing their position in a "racked barrel" so they can't slide against each other, then reversing the barrel's

GLASS BARREL HEAD LETS RESEARCHER VIEW ACTION

direction halfway through the cycle to get a uniform finish. This is a good trick, but only if your hand-finishing costs are exceptionally high.

Slidabrading works best at replacing such processes as hand filing to remove burrs or produce a radius, polishing or buffing to smooth a finish, and, in some cases, belt sanding. At Westinghouse we slidabrade parts for such diverse products as breakers, refrigerators, switchgear motors, and jet engines.

Why slidabrade?

We've found that slidabrading slashes over-all production costs by slashing labor costs. The only manual labor involved is loading and unloading the barrel, starting the rotation and setting the controls, and occasionally screening abrasives and flushing out the barrel. One operator can tend several barrels. Compared with hand finishing, slidabrading stacks up well, as these examples show:

COPPER CONTACT, 2¾ x 2 x ¾ inches. Deburr, apply radius, produce grained surface. By hand filing and wheel polishing — 48 pieces an hour. By slidabrading — 150 pieces an hour.

Decrease in direct labor cost — 92%
Increase in production rate — 213%

STEEL GEAR, 2 x ¼ inches. Deburr, produce uniform finish. By hand filing — 30 pieces an hour. By slidabrading — 171 pieces an hour.

Decrease in direct labor cost — 97%
Increase in production rate — 470%

MOLDED BAKELITE BREAKER HOUSING, 2½ x 3½ x ¾ inches. Remove fins, deburr edges. By hand file or wire brush — 200 pieces an hour. By slidabrading — 517 pieces an hour.

Decrease in direct labor cost — 87%
Increase in production rate — 158%

How to slidabrade

It's control of these six variables that converts ordinary tumbling to slidabrading:

1. Barrel size. Most slidabrading barrels are 6- or 8-sided, and many of them are 32 inches in diameter. Their length depends on the number of compartments--anywhere from one to six. Multiple-compartment barrels make it possible to process more than one lot of parts at a time.

In selecting a barrel size, consider the parts to be finished. How large are they? How much do they weigh? What are they made of? The larger the barrel, the greater the sliding distance and the faster the abrading action. That's why delicate parts are usually slidabraded in a small barrel.

2. Abrasives. Your best bet may be aluminum oxide or granite chips. You can get them in seven or eight sizes, ranging from 1/16-in. to 1½x2-in. screen. Among the many other available abrasives are wooden balls and ground ivory nut for fine burnishing.

What about chip size? Large chips mean fast cutting and coarse finishes. If you process a part that has holes or recesses, pick a chip that won't lodge in them.

If the part has heavy outside burrs and small burrs around holes, you would be wise to use a combination of large and small chips. Large chips remove outside burrs. Small ones pass through holes, deburring the edges.

3. Loading the barrel. Under average conditions, the mass of parts and abrasive should fill about 60% of your barrel. The parts-to-abrasive ratio should be between 1-to-2 and 1-to-3, by weight. But you can allow a larger proportion of parts if they're bulky or heavy.

With fragile parts, it's often necessary to fill 75% of the barrel, alternating layers of parts and layers of abrasive. If you use lightweight abrasive, figure your parts-to-abrasive ratio by volume instead of by weight.

4. Additives. Chances are you'll add water to the parts-abrasive mixture, although this isn't always necessary. Water keeps parts clean, serves as a lubricant, and helps stop the abrasive from "loading" on the part.

With aluminum oxide chips, add water to a point slightly below the top of the mass. If there's no foaming problem, the water level should be 2 inches above the mass. The less water added, the faster will be the cutting speed and the rougher the finish you will get.

Other additives may improve your process. With iron or steel parts, it's a good idea to add about a

pound of soda ash or trisodium phosphate to each compartment. This helps soften the water, retards rusting while parts are drying, and improves chip-cleaning action.

But, if parts are free of oil and grease, cleaners or softeners aren't essential. And sometimes they should be avoided. Aluminum and magnesium, for instance, are attacked by alkalis.

Without changing the barrel's contents, except for water, you can polish parts after abrading them. Just add burnishing soap after you've finished abrading. It'll replace the cutting action with polishing action. The amount of soap: ½% of the weight of the abrasive.

5. Barrel speed. Most parts can be slidabraded at 80 to 200 sfm. That's 10 to 25 rpm. with a 32-in.-diameter barrel. Suit speed to part being finished. Heavy, hard parts can stand greater speeds. Be sure to avoid drastic surface changes and to keep parts from dropping in the barrel. They should turn over gently and slide in the mix.

6. Time turned. Your chief factor here is what the part is made of. Soft materials (copper, brass, aluminum, magnesium) need a fraction of the time required by hard materials (iron, steel).

How long you rotate the barrel also depends on the part's shape. Suppose it took 1 hour to remove a light burr from a flat piece of steel. Bend the same piece like this ⌐ ¬ and, everything else being equal, you'll probably need about 6 hours to finish the job.

What slidabrading costs

What'll you pay for slidabrading equipment? Not much, considering the benefits. In one year a Westinghouse installation yielded savings three times its original cost.

Here's the bill for an average slidabrading set-up at Westinghouse:

Barrel, 32 inches in diameter and 48 inches long, with two compartments, rubber lining, and 1000-lb. capacity, motor, controls	$1800
Jib crane, barrel truck, loading pan, screens	800
Installation (assuming electricity, water, and drain are available)	200
Total	$2800

Some slidabrading equipment costs more than that, some less. Normally this rule holds: The greater the variety of parts and operations for which you use your equipment, the more you'll pay.

Abrasive costs vary, depending on the type and amount used. Electric power and such additives as soap and soda ash have only a slight effect on operating expenses. But our experience shows that costs are hiked somewhat by compounds for high-luster burnishing.

Look through the back pages for...

... **Important New Catalogs** · You can use them on your job. They're free—and easy to get. Just check the coupon and mail it to us. We do the rest. **Page 146.**

... **Maintenance Pointers** · Reclaiming wood blocks saves Lockheed $20,000 a year in floor costs. Read how it was done. Also other new plant engineering methods. **Page 152.**

... **What's New in Equipment** · A "trade show" for plant operating men. Featured this month: the Octopus, a fork truck that wins all prizes for versatility. **Page 158.**

... **Practical Labor Relations** · Does Taft-Hartley protect heat-wave strikers? Must you pay to "bawl out" your workers? Can a union punish wildcat strikers? Thought-provoking answers to these questions — plus other helpful hints on labor problems. **Page 218.**

... **PEP** and **POP.** Answers here to some of your tough *plant engineering* and *plant operating problems.* PEP's on **page 254;** POP on **page 258.**

... **You Mustn't Miss** · Industrial news and ideas. For instance: Automatic assembly will soon move into the electronics industry; General Electric is developing new machines to do the trick . . . You can palletize your cameraman if you're planning to film your plant in action . . . How it pays to apply industrial engineering techniques to maintenance. **Page 264.**

... **Books and Booklets** · A guide to current reading that helps you get ahead in your job. Leads off this month with *Progress in Productivity, 1914-1947,* a factual book about productivity in U. S. manufacturing industries. Also reviewed: a new booklet on industrial survival in case of atomic attack. **Page 304.**

... **Industrial Films** · Capsule reviews of training films and new movies of interest to plant operating men. **Page 316.**

... **Behind the Byline** · Photos and thumbnail sketches of FACTORY authors. **Page 322.**

The startling facts about

A Revolution in Incomes in America

- **Real income per capita has more than doubled in the past 50 years.**
- **The majority of families have moved out of the lower income groups into middle income brackets.**
- **Even before taxes, incomes have moved sharply toward equality since 1929. At that time the top 1% of the population received 17.2% of the income. By 1948, their share had dropped to 9.0%. Income taxes have further equalized income.**
- **The effects of taxes and inflation combined make it necessary for a man to earn $11,110 today to equal $5000 in 1940.**
- **Industry must step up efficiency considerably if the same rate of income progress is to be maintained in the future. Income progress in the future will have to depend much less on income redistribution, much more on increasing the output per man-hour.**

By STAHRL EDMUNDS • McGraw-Hill Department of Economics

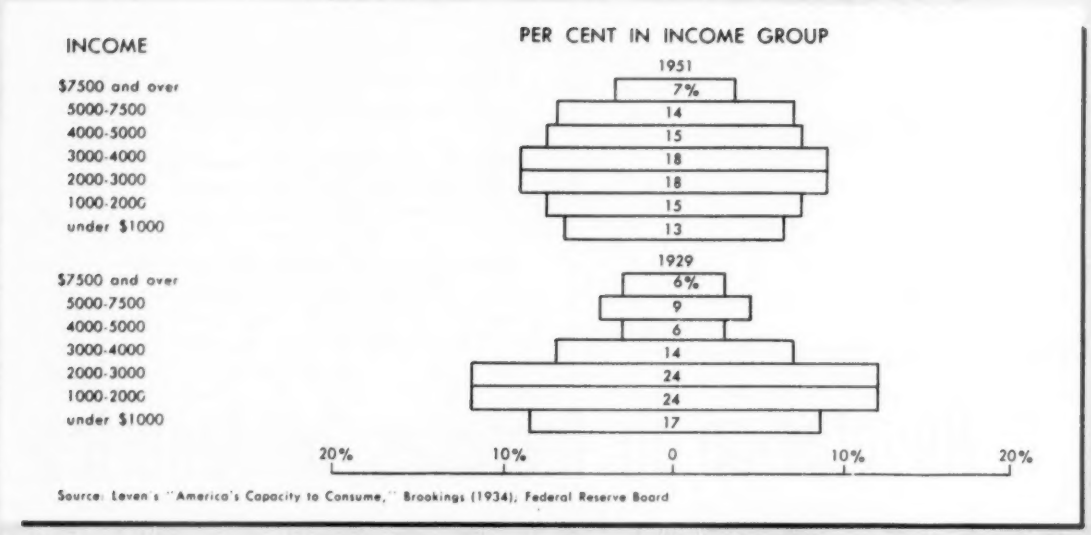
"FEW AMERICANS . . . are aware of the transformation in the distribution of national income that has occurred within the past twenty years—a transformation that has been carried out peacefully and gradually, but which may already be counted as one of the great social revolutions of history."

Arthur F. Burns, Director of Research, National Bureau of Economic Research, uses these words to describe one of the most momentous changes that has occurred in the American economy in recent years.

The main forces at work, changing the American economy and incomes, have been two wartime inflations, a major depression, progressive income taxation, and expansion of plant and equipment which has increased the productivity and the earnings of the people.

Growth in Per Capita Income

The income received per person in the United States is a good general indicator of our national well-being. The per capita income can be adjusted for price changes. This gives us a measure of the



GRAPHS SHOW MARKED MOVEMENT OF U.S. FAMILIES FROM LOW TO MIDDLE INCOME BRACKETS SINCE 1929.

changes in "real" income or how much goods the income will buy. Here is a table showing the changes in per capita income:

Growth in Per Capita Income of the American People After Income Taxes (in 1951 dollars)

Year	Per Capita Income
1900	$687
1909	768
1914	779
1919	815
1924	921
1929	1016
1934	805
1939	1027
1944	1477
1949	1363
1951	1443

Sources: Economic Report to the President, January, 1952; and Leven's "America's Capacity to Consume," Brookings (1934).

From these figures we can see that the per capita "real" income has about doubled in the past 50 years. The growth in income has been fairly steady throughout this period, although there were some minor setbacks in per capita income after World Wars I and II, plus a major decline in the 1930's.

Much of the increase in incomes has been due to the increased efficiency of American industry. Industrial efficiency has come from the use of new techniques and improved machines which step up the output of goods that can be made with the same amount of labor. This efficiency is measured by output per man-hour of work, and it is usually called "productivity." Output per man-hour has increased at an average rate of about 2% per year.

It is interesting to notice that productivity, or industrial efficiency, has been rising faster than the real income per person. Productivity has doubled every 30 to 35 years, but it has taken 50 years to double the real income per person.

Why hasn't the growth in income kept pace with the improvement in industrial efficiency? The main explanation for the difference is that people prefer to take some of the benefits of productivity in other ways than greater income. They prefer to work shorter hours, for instance. More government services, protection, and security have also been demanded in recent years. Then, too, more of our output has been plowed back, or invested, in new productive plants. Building new industrial plants increases goods and incomes in the long run, but temporarily it does require savings and postponing consumption.

All these benefits reduce somewhat the immediate income made available by rising efficiency, hence lessen the rise in income. Nevertheless, the rise in real income per person has been very substantial.

Redistribution of Income by Income Classes

Even more striking than the growth in the income received per person has been the shifting of families and single individuals among income brackets. This can best be shown by a per cent

distribution of families and single individuals in each income class over a period of years. The table below shows rough estimates of income distributions from 1890 to 1951. The effects of price increases have been removed from this table. These figures, therefore, reflect the shift in incomes due to an upgrading of real earning power and standard of living.

Distribution of Income for Families and Single Individuals in Percent (in 1951 dollars)

	1890	1921	1929	1935	1942	1951
Under $1000	28%	18%	17%	21%	15%	13%
$1000-$2000	26	25	24	30	18	15
$2000-$3000	21	24	24	22	20	18
$3000-$4000	6	14	14	11	15	18
$4000-$5000	9	7	6	5	10	15
$5000-$7000	4	7	9	7	14	14
$7500 and over	6	5	6	4	8	7

Source: McGraw-Hill estimates from data by Spahr, King, Leven, National Resources Board, OPA and Federal Reserve Board.

The most significant fact from this table is that a tremendously large middle class has been created in America. This is a middle class made up of employees who earn wages and salaries from their factory and office skills.

The extent to which persons have joined the middle income groups is clear from the figures for 1951. First of all, you see how small a proportion of people are at the extreme ends of the income scale. Only 13% have incomes below $1000 and only 7% have incomes over $7500. On the other hand, we find that 80% of the people have incomes between $1000 and $7500, or 65% between $2000 and $7500.

Perhaps this increase in the middle income groups would be even more striking if compared graphically with 1929. This is done on the chart on the facing page.

Notice how differently these graphs are shaped. The pattern of income distribution in 1929 shows more people in the low income layers, with a few incomes spindling up into the higher brackets. The pattern for 1951 shows relatively few in the lower income layer, and the vast bulk of the people in the middle income layers.

We might add that these income figures are before taxes (in other words, gross income). A tremendous shift in income has taken place, therefore, even before we introduce the effects of income taxes.

Tendency Toward Equalization of Income

Another way to look at the distribution of income is to see how much of the total income each group or class gets. If incomes were distributed equally, then each 10% of the population would get 10% of the total income, or each 1% of the people would get 1% of the income. We all know, of course, that incomes are not equally distributed in this way, but few of us are aware how much more equal they are becoming.

Dr. Simon Kuznets made a study, published by the National Bureau of Economic Research, in which he shows the proportion of income received by the top 5% of the population. In 1929 the top 5% of the population received 31.9% of the income (before taxes), but by 1948 this share had dropped sharply to 19.5%. The drop in per cent of income received by the top 1% of the population is even more startling; its share has been cut almost in half. In 1929 the top 1% received 17.2% of income, and by 1948 this had been cut to 9.0%.

Remember that this is income before taxes; therefore, the higher tax rates have no part of the explanation of the tendency toward equalization. True, the effect of the highly progressive income tax rates has *furthered* the trend toward income equality, but that point will be covered later.

The point is that there have been powerful forces at work, regardless of the effects of taxation, to level out incomes.

What have these great levelers of income been?

The inflations that go hand in hand with wartime create a huge inflow of new money into the hands of the public at the same time that goods are being taken out of the economy to be shot up in combat. The result is a scarcity of goods and a high incentive to produce more. In trying to produce more goods, the supply of labor becomes critically short. There is nothing quite as powerful as scarcity to drive up wages. This is what happens with the price of labor. Wages go up rapidly during a manpower shortage.

From 1941 through the present time, there has scarcely been a time (except for brief periods in 1945 and 1949) when unemployment has exceeded 2-million people. We have had more than a decade of what some economists call "over-employment." It is this decade of labor scarcity that has raised the value and wages of the worker. Particularly, the people who were in low-wage occupations, or who were less employable, came into demand at higher wages.

The result has been commonly observed throughout industry and commerce as a flattening in the wage and salary scales. The lower or minimum wages paid have moved up rapidly; the higher wages and salaries (particularly of supervisory and semi-professional personnel) have risen more slowly.

Turning to the upper income groups, we find that their incomes are in larger part derived from investments rather than from personal employment. During the past decade, the interest rates, rent, and dividends have failed to rise as rapidly as worker's compensation or prices.

Part of the low level of return for all types of

investment has been due to government action, such as rent control, pegging the interest rates, and excess profits taxes on corporations. Then, too, savings were high during the war period because people could not get goods upon which to spend their rising income. This also helped make capital relatively more plentiful than labor.

Effects of Taxation on Income Distribution

The effects of progressively higher rates of income taxation have been, naturally, to hasten and accelerate the tendency toward equalization of income. This can be seen very clearly from the data of Dr. Kuznets, again, for the top 1% of the income recipients in the population.

Share of Income of the Top 1% of Population

	Before Taxes	After Taxes
1929	17.2%	18.9%
1939	13.3	12.3
1948	9.0	7.2

These figures show that the income after taxes declined even more sharply than the income before taxes. The share of income of the top 1% of population dropped from 18.9% of total income in 1929 to 7.2% in 1948.

The combined effects of both taxation and inflation upon incomes can be shown together; and the combined effects are drastic. This has been shown in a study by Curtis L. Jones, certified public accountant with the Federal Power Commission, Washington, D. C. The table below shows the gross income which is now required to have the same purchasing power as in 1940. All figures are for a family of four.

1940			1952		
Gross	Approximate Income Tax	"Take Home" Pay	"Take Home" Income Required for Equivalent of 1940 Purchasing Power	Approximate Income Tax	Gross Income Now Required to Equal 1940 Purchasing Power
$3,000	none	$3,000	$5,660	$ 745	$6,405
4,000	$27	3,973	7,500	1,275	8,775
5,000	65	4,935	9,310	1,800	11,110
10,000	395	9,605	18,125	6,375	24,500

These facts tell us that a family of four who had an income of $3000 in 1940 would need to have an income now of $6405 to offset the effects of inflation and taxes. A family with a $10,000 income in 1940 would need an income of $24,500 now to have equivalent purchasing power.

The Future of Income Equalization and Income Progress

We have seen that per capita incomes have increased substantially in recent years, and that incomes have become more equal. Will this continue?

To decide whether progress in income will continue, we must first make sure of the source of progress. Out of every $11 increase in real income that was received by the lower 95% of the population between 1929 and 1948, $4 came from income redistribution or by reducing the proportionate share of the top 5%. The bulk of the increase, $7 of the $11, came by increasing the output per man-hour of workers through improved machines, techniques, management skill, and labor cooperation.

The future holds less opportunity for increases in incomes to the lower 95% of the population through income redistribution than was possible in the past. Obviously, since incomes have already gone a considerable way toward equality, it is going to be less and less possible for the lower income groups to make gains at the expense of higher-income groups in the future. This fact is not generally realized. In fact, most people still hold fantastic notions on the amount of benefit they could gain by income redistribution.

These hopes are unrealistic. But people will still expect to make progress in their incomes. They have become accustomed to a rate of income progress which, if it should falter, could cause unrest.

Therefore, productivity must be stepped up in the future to provide the income gains comparable to the past. The income progress of America hinges on raising output per man-hour faster and more steadily than ever before. This will require unprecedented skill and imagination by business management, with full cooperation of engineers and labor. It can be done only by improving techniques and equipment more rapidly than in the past.

Such progress will be possible only if more vigorous research is carried on to raise productivity, if all business is more alert to the installation of cost-saving equipment as rapidly as it is available, and if stronger incentives are devised to junk old machines for better ones.

Raising productivity by these means is, indeed, one of the foremost challenges of business today. There is little more to be gained, for the bulk of the citizens, by redistributing income from the high income to the lower income groups. Only productivity can, in the future, fulfill the expectation of the American people for income progress.

What Should Maintenance Cost?

There is no simple formula. There is no single dollars-and-cents answer. What maintenance should cost you, depends on your answer to . . .

How Well Are You Doing the Maintenance Job? *Begins on page 114*

Type of organization is important. So are craftsmen, tools, and workplaces. Also the procedures for directing and controlling the work. To find out where you stand, see FACTORY's survey of maintenance practices in 542 plants – the most significant maintenance survey ever made.

It will help you appraise the level of your own plant's maintenance setup. But it won't tell you the *quantity* or *quality* of maintenance *you* really need. How do you measure these? Not the way many plants think – not by looking at the other fellow's job. Industry still must learn . . .

Why You Can't Compare Your Maintenance With Other Plants. *Begins on page 126*

Don't try. Not even with plants the same size and in your own industry. It just won't work. There are many reasons why. FACTORY spells out some of the big ones. You'll then see that you have to develop your own reliable yardsticks. They alone will show you . . .

How to Measure Your Maintenance Needs. *Begins on page 128*

There are various yardsticks that you can set up yourself to measure the quantity, quality, and efficiency of your plant's maintenance job. FACTORY suggests five and gives you the principles behind them to guide you to *your* answer to the question: "What Should Maintenance Cost?"

A final word of warning. When maintenance costs seem out of line . . .

Don't Tear the Hide Off Your Plant Engineer. *Begins on page 134*

Wait, anyway, till you're sure you aren't loading your maintenance department with (1) "government work," (2) "things it never should make," (3) "unfinished business." They can lick you if you don't look out.

How Well Are You Doing the Maintenance Job?

HOW MANY MAINTENANCE CRAFTSMEN?

IN THESE 15 MAJOR INDUSTRIES . . .	YOU'LL FIND ONE MAINTENANCE CRAFTSMAN FOR THIS MANY . . .		
	. . total plant employees	. horsepower of connected motor load	. . square feet of plant manufacturing area
Petroleum and coal products	3	41	(See note above, right)
Chemical processing	8	59	7,727
Primary metal industries	9	133	10,439
Pulp and paper	10	180	4,773
Stone, clay, and glass	10	65	3,793
Food processing	12	56	5,995
Rubber and rubber products	13	94	5,114
Fabricated metal products	18	81	7,197
Transportation equipment	18	73	5,744
Textile mill products	20	68	7,744
Furniture	23	69	9,366
Electrical machinery	27	105	7,089
Machinery (except electrical)	28	92	7,953
Printing and publishing	32	52	6,890
Instruments	37	60	5,294
All other manufacturing	13	47	5,545

WHAT THIS MEANS. These figures make clearer than ever the tremendous variation in maintenance forces from one industry to another.

The often-used "standard" of the ratio of maintenance to total plant employees, for example, is 12 times greater in "petroleum" than in "instruments." But there's an explanation for it, of course: Instrument manufacture involves a great deal of hand assembly. That means lots more production personnel (and, therefore, more total plant personnel) and less heavy equipment to maintain, so the ratio

WHAT EFFECT HAS PLANT SIZE ON NUMBER AND KIND OF MAINTENANCE

IN PLANTS OF THIS SIZE (TOTAL PLANT EMPLOYEES) . . .	. . . YOU'LL FIND THIS NUMBER OF MAINTENANCE EMPLOYEES PER 100 PLANT EMPLOYEES . . .	. . MADE UP OF THESE TYPES (AS PER CENT		
		CRAFTSMEN	CLERICAL	DRAFTSMEN
500-1000	8.3	80.0%	2.9%	2.5%
1001-2500	10.0	81.5	3.5	1.8
Over 2500	7.8	84.9	3.0	1.8
All plants (over 500 employees)	8.6	83.1	3.2	1.9

WHAT THIS MEANS. The variation by plant size in number of maintenance employees per 100 plant employees is influenced heavily by the size of individual units in certain industries. The proportion of maintenance-to-plant employees in petroleum is almost 3 times as high as in any other industry (see table above). Nearly all of the petroleum refineries included in the survey had between 1001 and 2500 employees. In all but one of the top 6 "high ratio"

THE 542 PLANTS reporting in this survey of maintenance practices represent 12% of all manufacturing plants in the U. S. with over 500 employees.

In total, these 542 plants have 1,116,374 plant employees; 93,451 maintenance employees; 5.8-million horsepower of connected motor load; 597-million square feet of manufacturing area; and 8.4-million square feet of centralized maintenance shop area.

The survey was made for FACTORY by the McGraw-Hill Research Department.

NOTE: Many of the plants in this category are petroleum refineries. Most of them have little area "under roof," but are spread out over many acres. Hence, "manufacturing area" is a meaningless concept for these plants.

. . . square feet of centralized maintenance shop area	UNITS REPORTING: Number of plants	UNITS REPORTING: Total plant employees
71	15	36,362
148	52	74,775
186	44	95,522
128	25	30,780
128	20	31,961
162	35	48,303
83	23	67,096
140	27	29,385
77	45	201,797
218	41	51,586
148	10	10,481
138	33	105,846
137	104	237,766
175	22	20,628
97	16	39,559
142	30	34,527

is low.

Now look again at instruments. It's a fairly light industry. So the "small" maintenance force carries even less than average "burden" in terms of connected motor load. And the industry ranks third in terms of the manufacturing area which must be serviced by each craftsman. If the maintenance shop area per craftsman looks small, it's at least partly because the industry uses little heavy equipment.

You can, and should, make similar analyses of all other industries before attempting comparisons or jumping to conclusions. Just as examples, let's look at the three figures in the table that seem most out of line.

• Pulp and paper has 180 horsepower of connected motor load per craftsman. Sure. Tremendous motors are needed to run its machinery. The actual number of motors per craftsman may not be large. And there's one other important factor. It is probable, though not certain, that many respondents included the horsepower equivalent of process heat consumed in answering this question. Pulp and paper uses plenty of heat. So do primary metals producers that have electric furnaces. That fact would tend to drive up the figures of those industries.

• Primary metals plants have only one craftsman per 10,000 square feet of manufacturing area. Only one other industry (furniture) is within 25% of this figure. But remember, steel and aluminum mills need plenty of wide-open spaces for heat dissipation and handling hot metal. And chances are, manufacturing storage areas were included in the figures. Storage eats up big areas in certain types of plants, almost none in others.

• Petroleum and coal products plants have only 71 square feet of centralized maintenance shop per craftsman. Explanation: The maintenance shop in a petroleum refinery is almost a specialty production shop. It's often organized like one. A large percentage of maintenance is scheduled. As a result, the utilization factor is very high—these shops don't have to take up a lot of space with equipment for occasional use. In case the maintenance shops "appear" inadequate as compared with the other industries, keep in mind that the actual average size of the shops in the 15 reporting plants was over 55,000 square feet. (Next highest average: primary metals, at 29,000 square feet.)

There's a different reason why transportation equipment is second from the bottom in size (see shop area column). This is the industry that uses area maintenance to the limit. So big central shops aren't needed. Average size is only about 12,000 square feet.

EMPLOYEES?

OF TOTAL MAINTENANCE EMPLOYEES) . . . SUPERVISORS, FOREMEN	PROJECT ENGINEERS	INDUSTRIAL ENGINEERS	STAFF ENGINEERS
9.3%	1.7%	1.3%	2.3%
8.5	1.4	1.1	2.2
7.5	0.9	0.5	1.4
8.1	1.2	0.7	1.8

industries in the table above, the preponderance of plants in the industry had less than 2500 employees. The exception is the primary metal industry—but even there, a goodly number of the plants are in the under-2500-employee group. The majority of the "over-2500" plants are in industries where maintenance constitutes a low proportion of total plant employment.

Except on the matter of the number of clerical employees, industry has little influence on the composition of the maintenance department. As the plants get larger, the department contains a larger percentage of craftsmen, a smaller percentage of "specialists" and supervisors. The somewhat higher percentage of clerical workers in 1001-to-2500-employee plants is probably due to the same "industry concentration" that influences totals in this size group.

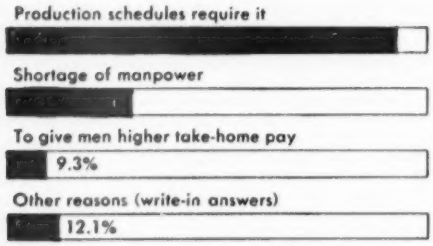
Turn the page

Begins on page 114

Scheduled overtime is common

Do you regularly schedule overtime work for maintenance and construction craftsmen?

Why? (Asked only of those who regularly schedule overtime)



Some plants indicated more than one reason.

WHAT THIS MEANS. Nine out of 10 companies schedule overtime because of the requirements of production schedules. This does not necessarily mean that maintenance work has to be done on overtime because production will not release the equipment during regular working hours. Some of this overtime is coverage by maintenance men when production is working overtime. Electricians, pipefitters, millwrights have to be available in case of breakdowns.

Few companies have training programs

Do you have a formal training program for maintenance craftsmen?

Do you have a formal training program for maintenance supervisors?

WHAT THIS MEANS. Almost everybody talks about the need for better maintenance training. But it's pretty obvious that, even among leading companies, few are doing anything about it.

This is one of the weakest points disclosed by the survey.

Is it worth doing something about? A spot check of companies with training programs indicates that – in general–the level of maintenance performance is higher and the whole function is better organized than in companies with no training programs.

Most craftsmen are in plant-wide unions

Are the maintenance craftsmen unionized?

Are they unionized by craft or by plant-wide union? (Asked only of those whose craftsmen are unionized)

Some companies indicated craftsmen are organized in both craft and plant-wide unions.

WHAT THIS MEANS. Obviously, you can't do anything about this in your own plant. But be sure you take it into consideration if you start analyzing another plant –or the 542 plants cooperating in this survey.

Since most of the plants in this survey have their maintenance men in a plant-wide union, there are fewer jurisdictional problems, less need for duplication of personnel, more opportunities for smoothly operating work-order systems, preventive maintenance programs, etc.

On the other hand, plant-wide unions bring up the problems of "bumping" during lay-offs or consolidations. The maintenance department can very well be loaded up with untrained men or men who have been away from their trade so long that they have to learn all over again. When these changes come in the middle of a budget period, maintenance labor estimates for that period are all out of line.

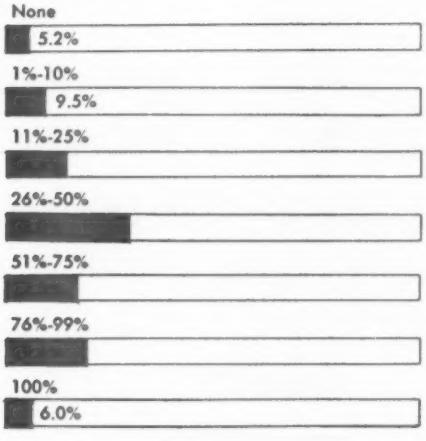
MAINTENANCE PAPERWORK

Most plants have work-order systems . . .

Do you have a formal written maintenance work-order system?

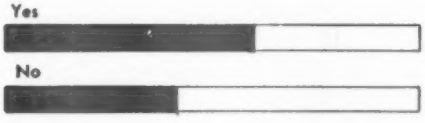
. . . but practice varies on scheduling work orders . . .

About what per cent of your work orders are formally scheduled?



. . . as it does on consulting production about schedules

Does the production department participate in scheduling maintenance work orders?



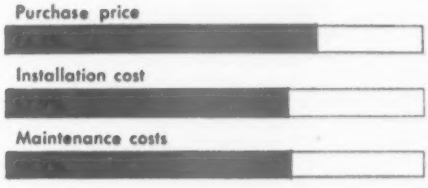
WHAT THIS MEANS. Comparison of answers to the first two questions shows that some companies claim they schedule work orders even though they do not have a formal work-order system. It's obvious that scheduling is more in name than in reality in some plants, for 30% of the plants schedule less than 25% of their work orders. In such plants, it is likely that the work-order system is largely a cost-accounting device.

Most plants keep equipment records . . .

Do you have plant equipment records in the maintenance department?

. . . and 7 out of 10 show maintenance costs

Which of these do the plant equipment records show? (Asked only of those who have records)

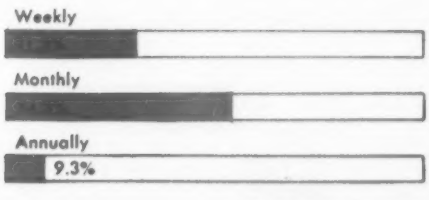


WHAT THIS MEANS. If practice of leading companies is the right standard, there can be little doubt that plant equipment records are a good idea for anyone.

But the completeness of the records leaves something to be desired. While about 70% of plants with records keep track of maintenance costs, less than half of all respondents keep tabs on all three of the items listed.

Maintenance departments make progress reports . . .

How often does top management get a report on maintenance progress?



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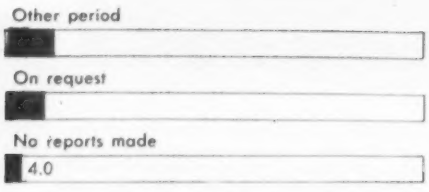
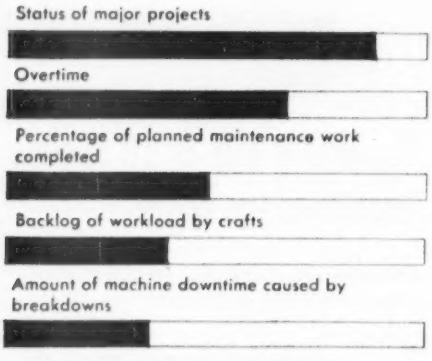


Some plants gave more than one answer.

. . . but many omit important information

Which of the following does the maintenance progress report to management include?


Status of major projects
Overtime
Percentage of planned maintenance work completed
Backlog of workload by crafts
Amount of machine downtime caused by breakdowns

Some plants gave more than one answer.

WHAT THIS MEANS. Some of the reports made annually and "on request" are in addition to reports at other regular periods. That only 1 plant in 20 makes no report is pleasantly surprising.

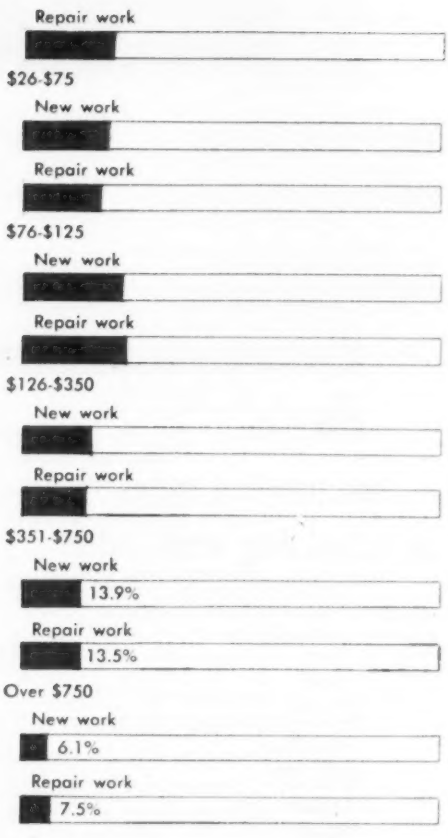
But the real surprise is the widespread failure of maintenance men to capitalize on the opportunities offered by progress reports. Less than 2 in 5 report on backlog of workload. If a maintenance department is undermanned (as is usually claimed), what better way to make the point to top management than by a report of backlog? Or is maintenance padding the payroll, and keeping mum about not having a backlog?

And only 1 plant in 3 reports on machine downtime caused by breakdowns. Unless this is reported to top management, it will never realize that downtime is the price of its failure to provide adequate maintenance.

The high percentages reporting on major projects and overtime are fine in themselves. But they indicate an overemphasis on big, immediate cash outlays, almost to the exclusion of the sources of probably even bigger but less obvious routine expenditures.

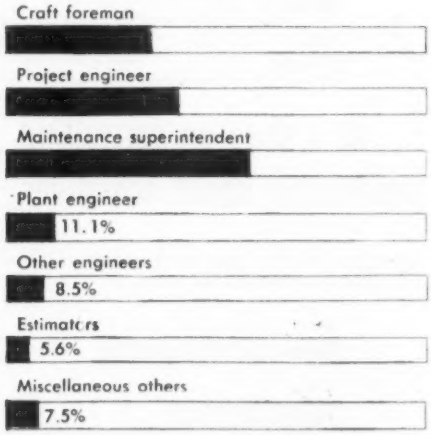
Minimum for estimating jobs varies widely . . .

What is the smallest job you estimate on?



. . . and there's no agreement on who should estimate

Who does the estimating?



Some plants gave more than one answer.

WHAT THIS MEANS. Type of industry has a lot to do with how small a job a plant will estimate. Answers *appear* to indicate that the figure is set as high as possible to

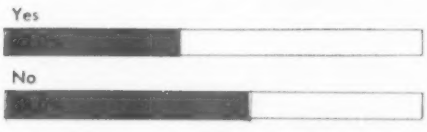
exclude the greatest number of jobs, but low enough to include most of the total dollars spent. Most companies use the same figure for both new and repair work. Ranges for answers were selected to group figures both above and below the most common individual figures: $50, $100, $250, and $500. About 24% of the plants did not answer this question, possibly indicating they do not estimate any jobs.

Most companies gave more than one answer to the question, "Who does the estimating?" Telephone spot checks showed that respondents apparently mean *either* of two or more men can estimate a job. But some meant their answers to indicate that more than one person must estimate on each job—or, at least, must OK an estimate.

ADMINISTRATIVE PRACTICES

Maintenance costs are too seldom part of equipment review

Does your company make a definite periodical review of costs of maintenance of all equipment as part of an equipment replacement program?



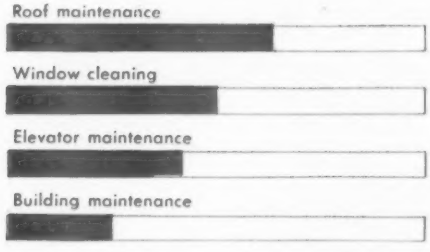
WHAT THIS MEANS. Even among companies with more than 500 employees—the only ones included in this survey—there's still a lot of by-guess-and-by-gosh as far as maintenance cost and its influence on replacement is concerned.

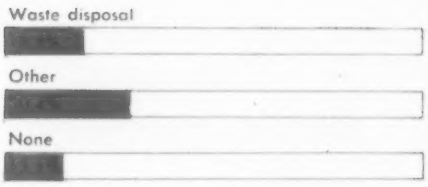
Of course, some of those who said "No" to this question may simply be indicating that they do not have an equipment replacement program, as such.

But the fact that better than 2 plants in 5 are doing this job indicates that it has real value.

Outside contractors are used for several types of work . . .

What types of maintenance work are regularly done by outside contractors?





Some plants gave more than one answer.

. . . but regular use of outside consultants is not general practice

Do you regularly use outside consultants on plant engineering and maintenance problems?

WHAT THIS MEANS. The key point on use of outside contractors is that less than one plant in seven does not use them at all. In other words, there appears to be almost a complete absence of the attitude, "We've got a maintenance department; why do we need outsiders?" There may be some of that, but it's conceivable that most, if not all, of the 13.1% that don't use contractors are really set up to handle every job that comes along—and do it cheaper than an outside specialist could.

Among the contract services listed in the "other" classification, none accounted for more than 5% of the total. And most were 1% or less.

When it comes to consultants, the feeling appears to be different: Less than 2 plants in 5 use them regularly. However, some respondents interpreted "regularly" to mean on a retainer basis. At the other extreme, some may have interpreted "regularly" to mean that a consultant drops in twice a year to advise on fire protection measures. We couldn't be sure of the extent to which such interpretations cancel each other out.

But the picture is sufficiently one-sided to leave little doubt that many plants—and quite probably many maintenance heads—consider it either an implication or admission of inability to do the job. Which way the

Begins on page 114

maintenance head takes it usually depends on whether top management calls in the consultant or whether he "goes to the boss and asks for help." Either attitude hurts rather than helps both the man and the department. There are so many specialized jobs in the plant these days that it just isn't reasonable or wise to expect even the largest organization to be always prepared to tackle every one.

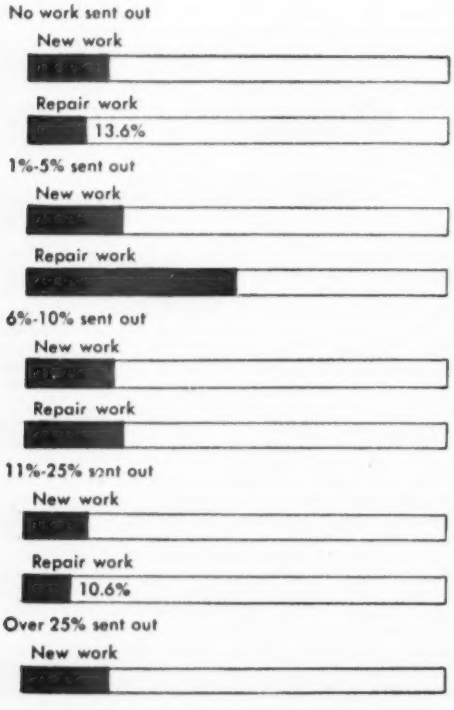
MAINTENANCE SHOPS AND STOCKROOMS

Most plants have a separate maintenance shop . . .

Do you have a separate shop equipped for all maintenance work?

. . . and generally send out less than 10% of shop work

About how much of your maintenance shop work do you send outside the company?



Most plants have a separate maintenance stock room . . .

Do you have your own maintenance stockroom?

. . . and the maintenance head determines the inventory

Does your plant engineer or maintenance head determine the size of the maintenance stock inventory?

WHAT THIS MEANS. Inasmuch as this survey was limited to plants with 500 or more employees, it's not too surprising to find the high percentage that have separate maintenance shops.

What is somewhat surprising is the size of these shops; they average just over 30,000 square feet. That average is boosted way up by a relatively few plants, however. Actually, only about 15% of the plants have shops larger than this average size. But even the median size is about 10,000 square feet; and only 13% of the plants have shops of less than 2500 square feet.

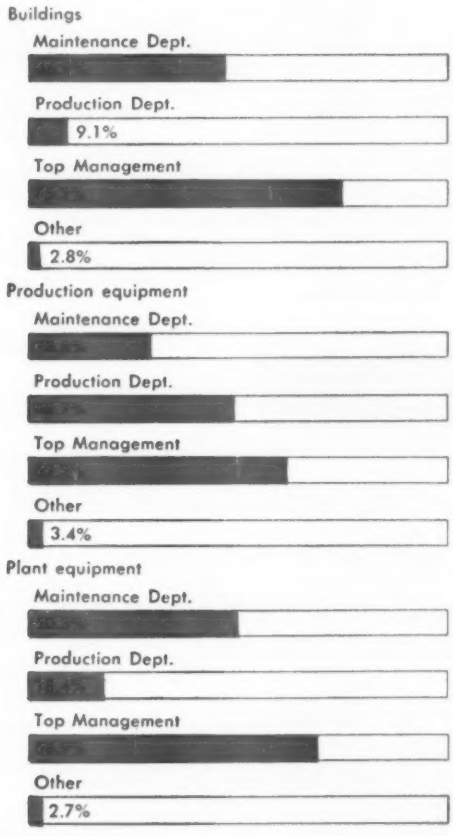
To see how size of the maintenance shop relates to the number of maintenance craftsmen, see chart on pages 114 and 115.

That only 20% of the plants are without separate stockrooms is a pretty good record, when you keep in mind that almost one-third of the plants – those with 500-1000 employees–have an average of only 58 maintenance employees of all types.

The autonomy given the maintenance department to determine its own inventories–even where it does not have a separate storeroom–is also encouraging.

There's no sharp "pattern" for authorizing maintenance expense

What department is responsible for authorizing maintenance expense for each of the following:



Some plants gave more than one answer to each question.

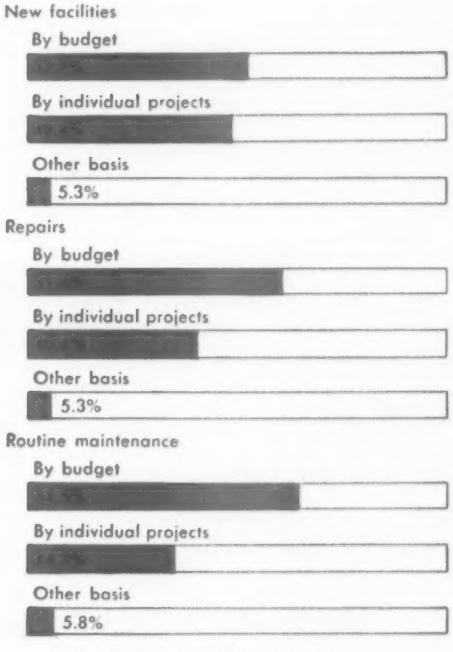
WHAT THIS MEANS. Only two things emerge clearly from this picture: Top management keeps a tight hold on all types of maintenance expense in a good majority of plants; and in less than a majority does the maintenance department have *any* responsibility.

Some of the multiple answers on this question indicate that *either* of two departments might authorize maintenance expense; in other cases, the respondents meant that *more than one* authorization was necessary. Few

One factor bears watching: This is the large number of plants in which production departments authorize maintenance expense on production equipment. In other words, production can tell maintenance how much maintenance should be done. That may be a good set-up –unless repairs are included in maintenance budgets, and top management is continually beating on maintenance department heads that costs are too high. Responsibility and costs should go hand in hand with authority to effect repairs before they become too costly.

A majority of plants use maintenance budgets...

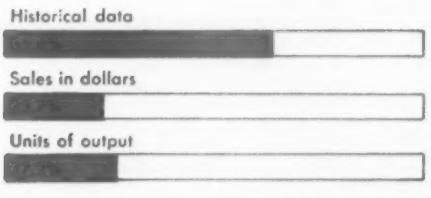
How are funds allocated for costs of each of the following?



Some plants gave more than one answer.

...and "historical data" is the usual budget basis

If funds are allocated by budget, on what basis is the budget established?



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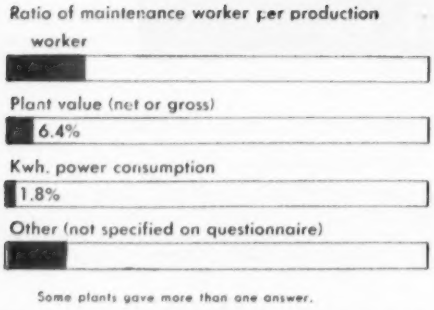

Ratio of maintenance worker per production worker
Plant value (net or gross)
6.4%
Kwh. power consumption
1.8%
Other (not specified on questionnaire)
Some plants gave more than one answer.

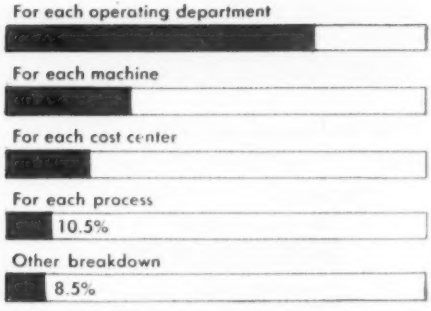
WHAT THIS MEANS. Some of the plants that gave more than one answer to the first of these questions indicated that budgets were the primary reliance, but that funds were allocated by individual projects wherever large amounts of money were involved. Almost half of those who specified an "other" basis of allocating funds said simply, "by management."

When plants gave more than one answer to the second question, one of the answers was usually "historical data." For example, if a budget is based on *last year's* sales, the respondent might check both "historical data" and "sales in dollars," to indicate that the budget is not based on a sales *forecast*. Except for the few cases where replies volunteered such information, the questionnaires do not indicate how many of the respondents made this distinction.

The "other" answers to the second question were widely scattered: About 3% said "needs"; no other answer accounted for more than ½%.

Most maintenance cost breakdowns lack detail

How are maintenance costs broken down?



WHAT THIS MEANS. One thing is clear beyond all question: Every one of the plants surveyed is *trying* to isolate the major sources of maintenance costs by breaking down those costs. More than one-third of the plants are breaking down their costs on more than one of the bases indicated.

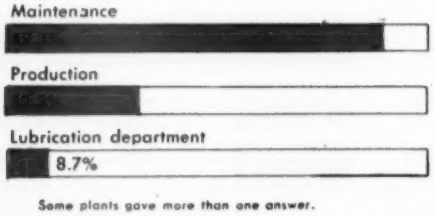
LUBRICATION

Lubrication is planned and scheduled . . .

Do you have a planned and scheduled lubrication program in effect?

. . . with responsibility sometimes divided . . .

What department is responsible for lubrication?



. . . and automatic, centralized lubrication is infrequent

Is the use of automatic centralized lubrication equipment a general practice in your plant?

WHAT THIS MEANS. Planning and scheduling lubrication is almost universal—as it should be if equipment is to be fully protected.

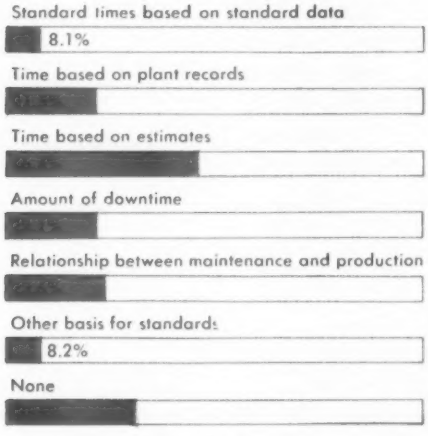
But responsibility for lubrication is divided in almost one-fifth of the surveyed plants. The questions do not indicate whether this division of responsibility is sufficiently clean-cut to prevent trouble.

That even one-fifth of the plants consider automatic centralized lubrication *a genera. practice*, indicates the considerable extent to which this type of equipment has proved itself to larger plants. Some plants volunteered the additional information that they were using the equipment, but not enough of it to consider it a general practice.

WORK MEASUREMENT AND INCENTIVES

There's no agreement on a basis for maintenance work measurement . . .

What standards of work measurement do you use to check the efficiency of maintenance workers?



Some plants gave more than one answer.

WHAT THIS MEANS. The fact that even a mere 8.1% of the plants in this survey use standard times based on standard data for measuring maintenance performance is proof for the doubting Thomases that it can be done. That doesn't say these plants use standard data for every job—any more than standard data are used for every production job in a plant.

"Amount of downtime" is a good measure of the *effectiveness* of the maintenance program – but it doesn't bear any necessary relationship to the *efficiency* of individual maintenance workers. Similarly, any relationship between maintenance and production is valid only if the nature and amount of the workload of both maintenance and production remain constant—and that's not too likely.

. . . and incentives for maintenance workers are rare

Do you have an incentive payment plan for maintenance employees?

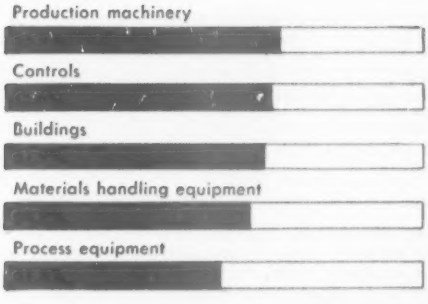
Undoubtedly, this general difficulty of establishing standards for maintenance is a prime reason so few companies use incentive pay plans for maintenance workers. The number of plants using incentive plans is too small to provide a statistically accurate sample for further breakdowns as to types of incentive, coverage, etc. But keeping that warning on sample size in mind, these plants report:

- One-third include supervisors in the plans.
- Two-fifths figure payments on an individual basis.
- The balance use group incentives.
- One-third of them have put 95% or more of all their maintenance work on incentive.
- One-third have put less than 30% of their maintenance work on incentive.
- One-half have had their incentive plans in effect more than five years.
- Nine-tenths of them say incentives have increased productivity of maintenance workers; but two-thirds of these say the increase has been 20% or less.

PREVENTIVE MAINTENANCE

Preventive maintenance covers almost all major assets

For which of these do you have a preventive maintenance program?



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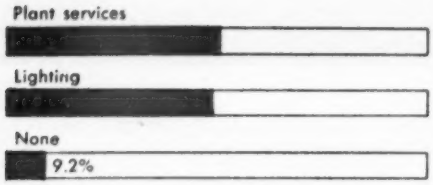


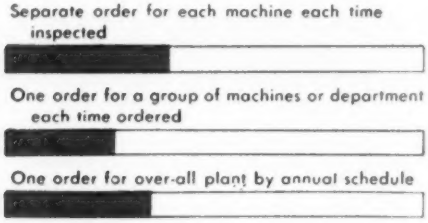
Some plants gave more than one answer

Check lists usually guide the work...

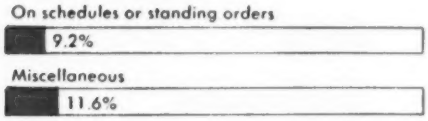
Do you use check lists in guiding preventive maintenance work?

...but there's no agreed way to order inspections

How are preventive maintenance inspections ordered?


Separate order for each machine each time inspected
One order for a group of machines or department each time ordered
One order for over-all plant by annual schedule

Other answers volunteered:



Some plants gave more than one answer

How many men for preventive maintenance?

IN THESE 15 MAJOR INDUSTRIES . . .	. . . YOU'LL FIND — this ratio of craftsmen doing preventive maintenance work to the total of maintenance craftsmen in the plant	. . . these percentages of the men on preventive maintenance putting this much time on the assignment: Full time	Part time, more than half	Part time, less than half
Primary metal industries	1 : 2.37	37.4%	48.4%	14.2%
Printing and publishing	1 : 3.20	44.5	15.1	40.4
Food processing	1 : 4.24	34.9	14.9	50.2
Furniture	1 : 4.67	20.8	71.4	7.8
Fabricated metal products	1 : 4.95	51.9	34.7	13.4
Pulp and paper	1 : 4.97	18.0	31.3	50.7
Stone, clay, and glass	1 : 5.13	17.9	8.0	74.1
Textile mills	1 : 5.28	44.8	18.3	36.9
Transportation equipment	1 : 5.35	68.2	13.9	17.9
Machinery (except electrical)	1 : 6.29	37.0	20.2	42.8
Electrical machinery	1 : 6.45	27.3	11.7	61.0
Rubber and rubber products	1 : 6.85	27.3	14.3	58.4
Chemical processing	1 : 7.10	64.4	16.7	18.9
Petroleum and coal products	1 : 8.37	60.5	32.5	7.0
Instruments	1 : 9.02	26.8	6.5	66.7
All other manufacturing	1 : 10.00	42.9	10.2	46.9

WHAT THIS MEANS. The first column, which shows the **proportion** of maintenance craftsmen on preventive **maintenance**, doesn't even begin to tell the story. You **have to relate** it to the data on full- vs. part-time as**signments.** That's the real indication of how seriously plants believe in preventive maintenance. And that also is why FACTORY asked the plants it surveyed to indicate what portion of its men on preventive maintenance were assigned full- and part-time.

1951 Maintenance Expenditure

INDUSTRY	% OF 1950 COST OF ALL MATERIALS, WAGES & SALARIES*	DIVIDED AS FOLLOWS: EQUIP. MATERIALS & SUPPLIES	LABOR
Rubber	5.74%	45.9%	54.1%
Chemicals	5.48	56.5	43.5
Stone, clay, glass	5.46	46.1	53.9
Transportation equip.	5.00	30.3	69.7
Primary metals	4.70	55.7	44.3
Lumber & furniture	3.89	52.7	47.3
Printing & publishing	3.89	33.9	66.1
Petroleum & coal	3.30	43.0	57.0
Textiles	3.22	56.7	43.3
Paper	2.85	31.3	68.7
Machinery (non-electrical)	2.34	51.3	48.7
Instruments	2.33	32.5	67.5
Fab. metal products	2.08	38.4	61.6
Food	1.99	55.8	44.2
Electrical machinery	1.29	43.1	66.9
Apparel	1.07	43.0	57.0
Leather	0.56	33.0	67.0
ALL 17 INDUSTRIES (average)	3.38	47.4	52.6

*Cost of materials, wages, and salaries from U. S. Census Annual Survey of Manufactures, 1949 and 1950, Bureau of the Census. Costs of contract services are included, costs of fuels and purchased electric energy are not

Another survey made by the McGraw-Hill Research Department provided the data for the tabulations on this and the next two pages. The survey covered 261 plants with 252,386 employees, individually selected by size and industry to be representative of all U.S. manufacturing.

WHAT THIS MEANS. Percentage of total expenditure devoted to maintenance varies, relatively, by more than 10 to 1 from highest to lowest in the various industrial classifications.

The proportion of maintenance expenditure devoted to materials, equipment, and supplies also varies by industry but not so widely. The high is 56.7% in textiles – possibly reflecting little need for high skill, high pay in the maintenance force, plus the fact that much of this industry is in the South, where labor rates are generally lower. At the other extreme is transportation equipment. Materials account for only 30.3% of the maintenance expenditure. This industry calls for a lot of skilled maintenance of complicated machinery, is concentrated geographically in a high-wage area. Be sure to take such factors into consideration.

1951 Maintenance Expenditures by Division or Craft

	BY SIZE OF PLANT (TOTAL EMPLOYEES) 101-250	251-500	501-1000	Over 1000
General maintenance*	63.9%	22.1%	11.0%	5.8%
Maint. mach. shop & toolroom	#	4.7	15.2	21.9
Steamfitting, pipefitting, plumbing	#	10.9	14.5	16.2
Mechanical, millwrighting, rigging	19.6	19.9	12.3	10.1
Electrical maintenance	6.2	11.7	13.1	10.1
Building construction	1.3	3.9	6.3	12.0
Custodial & janitorial	8.3	7.9	1.5	0.6
All other	0.7	18.9	26.1	23.3

*Consists of expenditures by maintenance departments which are not divided into divisions and crafts as well as general maintenance divisions in plants where the maintenance department has such a division.

#Less than ½%.

WHAT THIS MEANS. As plants get larger, more specialized divisions and crafts are set up, and maintenance expenditures are more likely to be allocated to specific accounts.

Among the "all other" maintenance divisions and crafts, none accounts for more 10% of total maintenance expenditure in any size group, and most are considerably less than 5%.

There are two functions whose proportion of maintenance expenditure drops off as plant size increases.

1. **Mechanical, millwrighting, and rigging.** The probable explanation is that the function, as such, does not "shrink," but merely that it becomes relatively less of an item in the budget as the plant takes on additional maintenance functions.

2. **Custodial and janitorial.** Many people believe this is not a maintenance function, and apparently the feeling is far more widespread in the larger plants. Divorce of this function from maintenance–as well as taking on additional functions–accounts for the fact that it almost vanishes as an expense item in larger plants.

Turn the page

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For which of the following services is the maintenance department responsible?

Replies are tabulated as a percentage of those plants in which the service is performed. For example: The survey showed 25% of plants with 101-250 employees do not have industrial trucks; in 60% of such plants that *do* have industrial trucks (as shown on chart) their maintenance is the responsibility of the maintenance department. In the remaining 40% of the plants that *do* have such trucks, their maintenance is the responsibility of another plant department, a contractor, landlord, or other agency.

	NUMBER 101-250
Bldg. insp. & upkeep	87%
Mtce. plan. & control	55%
Mtce. elec. equip.	73%
Repair elec. equip.	70%
Mtce. mech. equip.	93%
Repair mech. equip.	91%
Mtce. indust. trucks	60%
Lighting	75%
Lub. plant equip.	82%
Sanitation	65%
Wiring	71%

Why You Can't Compare Your Maintenance Costs With Other Plants

Let's forget this business of gaging your maintenance needs by comparative statistics from other plants.

It looks like a good shortcut. But it doesn't work. It can lead you fast into too little or too much maintenance.

Nobody can tell you what your maintenance should cost. You have to find out for yourself. But first you need to know the pitfalls of using comparative data. Here are the facts.

FOR YEARS FACTORY has been bombarded with inquiries from industry on maintenance cost data. They come from top management, operating, and maintenance executives who are becoming conscious of the impact of maintenance costs on narrowing profit margins.

We find to our dismay that in almost every case industry wants these cost figures to use as a yardstick for gaging its own performance.

We don't say these cost data are valueless. They *do* tell you how you stand in your field. They are helpful where you are sure the statistics have been developed on a fairly comparable basis – which won't happen very often. But they don't tell you any more about the effectiveness of your own maintenance department than a man's hat size tells how much brains he has.

Sure, you can find out what maintenance *does* cost in your industry, or even what it specifically *does* cost in your plant. But what *should* it cost in *your* plant? There's a big difference.

Trouble is, industry has been going at it the wrong way. Industry has been looking for a dollars-and-cents formula instead of a "how-much-is-needed" answer. Your dollars-and-cents approach, too, is apt to overlook important indirect costs, such as downtime, poor product quality, and lowered output.

OF EMPLOYEES		
251-500	501-1000	Over 1000
96%	88%	88%
80%	84%	85%
93%	95%	99%
90%	93%	98%
91%	98%	98%
93%	98%	98%
71%	91%	89%
88%	98%	97%
87%	93%	99%
78%	86%	92%
93%	88%	99%

WHAT THIS MEANS. This tabulation does not, of course, take in every possible maintenance function. It does, however, cover enough different maintenance functions to establish a clear and definite trend.

As the plant gets larger, so do the responsibilities of the maintenance department. Maintenance departments don't merely organize and allocate expenditures along more specialized lines—as shown in the table at the bottom of page 125. They take on added functions as well.

Note that once a plant exceeds 1000 total employees, it is rare to find a maintenance department that is not responsible for almost everything in sight. The exceptions are the infrequent jobs that call for special skills or special knowledge. As indicated by the question about use of contractors (page 119), companies continue to go "outside" for such services. But even there the large company is less likely than the small one to engage a contractor.

Here are ten good reasons why you should shy away from maintenance cost comparisons:

1. Definition of maintenance. No two plants include the identical functions in their maintenance program. Some plants include porters, watchmen, cranemen, salvage – some don't.

2. Weight of product. Heavier products involve larger plants, bigger equipment, more wear and tear, and hence a need for more maintenance.

3. Age and condition of plant and equipment. As your plant and equipment gets older, it requires more maintenance.

4. Type of operation. Obviously, the cost of maintenance varies with the type of industry. An oil refinery, for example, seems to need about ten times as many maintenance people as a machinery producer with about the same total number of employees.

5. Multi-shift operation. Production and auxiliary equipment wear out in proportion to hours of service. A 2-shift plant will call for higher maintenance costs than a 1-shift plant.

6. Quality of maintenance. Management policy has a lot to say about this. One plant manager insists on having the entrance door handles polished every day – and runs up a bigger maintenance bill than the one who's satisfied with a weekly polish. Another plant manager lets things go to pot – and cuts his costs almost to zero. Do you want to compare your costs with either?

7. Efficiency of maintenance forces. Here's where proper organization, good supervision, good tools, and an adequate shop and stockroom play a big hand. Also methods study, work measurement, materials research, work planning and scheduling.

8. Accounting standards. There is no standard maintenance accounting system. Some plants throw engineering costs into maintenance, or experimental costs. Some make no distinction in allocating cost of upkeep, repairs, or replacement. In some plants lots of maintenance isn't labeled as such, and gets into other accounts. Perhaps even worse, lots of non-maintenance gets charged to maintenance.

9. Labor costs. Dollar-wise you can't compare maintenance costs because hourly wages differ in various localities.

10. Amount of mechanization. The more highly mechanized plants need more maintenance, hence maintenance costs are proportionately higher. Savings in direct labor, however, may be many times greater. So of what use is even a direct-indirect labor ratio comparison?

Here's another reason you shouldn't gage your need against today's costs. Maintenance stands today at the same threshold of opportunities to improve itself where production stood a generation ago. It has not made the same progress in its use of modern methods and tools that production has. It's still immature. So when you try to compare your maintenance costs with others, you start with a poor standard.

Management is on the right track in wanting to examine its maintenance costs. But it's making a terrific mistake in wanting to appraise its own performance by what others are doing.

How, then, can you find out what your maintenance should cost? How can you tell what is the right amount of maintenance? How do you know whether you're doing too much or too little? How can you control the quality of maintenance?

In the next six pages FACTORY suggests how you can set up your own reliable yardsticks to answer these questions.

How to Measure Your Maintenance Needs

By CARL G. WYDER • Maintenance Editor, FACTORY

HARDLY A DAY GOES BY without some plant man asking us:

"What can I use for a yardstick to measure maintenance?"

We have discussed this yardstick problem with many top management people, as well as plant engineers and maintenance executives. Almost to a man, they hoped at one time or another to use comparative industry figures to measure maintenance. Then, in pursuit of this will-o'-the-wisp, they discovered for themselves the error of the comparison method. Or else FACTORY editors showed them why comparison doesn't—and can't—work (as they have on the two preceding pages).

We have always believed that you *can* measure the maintenance job. But we say again, as we have said before, that each plant has to set up its own yardsticks. You may have to use several, to measure the quantity, quality, and efficiency of your maintenance.

In the pages that follow, FACTORY gives you five such yardsticks. One or more of them may work for you—we can't tell you which ones. But we *can* give you the principles behind them. Then you can decide for yourself which ones to apply in your own plant.

YARDSTICK NO. 1 • TO MEASURE ...

Size of Maintenance Job

Everybody can use this yardstick, regardless of type of industry or size of plant. Many maintenance executives have used it to start off their operations.

First, you list all the structures, equipment, and services in your plant. In short, you make a *complete* inventory of *all* physical assets. Some plants keep these data in a plant equipment record—and they keep it up to date. (But we've seen plenty of plants that still don't have *complete* or *up-to-date* records, if any at all.)

Second, you list what the maintenance department must do to maintain all these assets in good working order. Production machinery, for example, needs inspection, adjustment, cleaning, lubrication, overhaul. Buildings need roof maintenance, cleaning, painting. Grounds need care.

This analysis isn't easy. And it must be thorough. It's equivalent to setting up a schedule of preventive maintenance in a new plant to keep it in good shape. In an old plant you have to add the work needed to restore it to good shape.

And to be practical about it, you have to figure on *repairs* as well as *upkeep.* If you do a good job of preventive maintenance, your repairs and emergencies, according to many reliable sources, will average 10% or less of your maintenance job. (We don't include repairs caused by an act of God. Or new work. When you try to establish them, you need something close to divine omniscience. Some of the best thinkers say these costs don't belong in regular maintenance; consider them as "extras.")

These two steps will tell you, in theory, the size of your maintenance job. Don't get the idea this method is purely academic and for the long-haired students of maintenance philosophy. You're dealing with facts and figures.

Several of the best maintenance organizations we have seen in the last year have used this yardstick method with excellent results to double-check and revamp the size of their maintenance program. It serves as irrefutable supporting evidence for the plant engineer who needs more funds to do a good job. And it helps management visualize the nature and complexity of the maintenance function.

YARDSTICK NO. 2 • TO MEASURE . . .

Size of Maintenance Force

Obviously, you can't decide this until you know the size of your maintenance job. That's one reason why it's important first to find out as accurately as you can *what* you must maintain.

First thing you do is convert each item of the total workload into man-hours of work for the various crafts and services. Now comes the important question:

What conversion units to use?

There is no single all-industry yardstick. Each plant has to derive its own. There are two approaches:

1. You can analyze every job down to its last component and apply work-measurement standards. The industrial engineer has been doing this for production for the last 25 years. He can do it for maintenance. (See "Apply Job-Standards to Measure Performance," FACTORY, January 1952, p. 78.)

2. The other approach relies on the experience and know-how of the maintenance executive and his supervisors and staff. Among them they can estimate the man-hours and skills needed for each job. They can get a lot of help from historical data, if available.

Both methods are being used by industry every day to estimate maintenance jobs. That fact alone should prove their validity.

To determine the size of your maintenance force, you apply the same principles:

You break your workload down into all its components, and apply work standards to the best of your knowledge. You match the work force to the job. You don't decide it should be 10% of your total plant employment just because you learned that was the industry average.

The answer you come up with isn't necessarily the final answer. Later we'll see why. But it does start you off with your manpower requirements. It's the way any good maintenance executive ascertains how many men he needs—and how much of the workload he should subcontract. And it's a yardstick by which you can gage improvement.

Don't overlook the fact that this is a changing yardstick, even in your own plant. As plant and equipment grow older, they need more maintenance. Should you change from 1-shift to 2- or 3-shift operation, your workload increases. Normal growth in area and mechanization also adds to the load.

So it might be wise to re-evaluate your needs in the light of today's conditions in your plant. Don't be surprised if you find an imbalance in workloads of various craft crews or different crews of the same crafts or services, particularly in routine maintenance.

YARDSTICK NO. 3 • TO MEASURE . . .

Efficiency of Maintenance Force

In the simplest sense, you judge the efficiency of a man by the time he takes to do a job as against the time you allow him. Let's assume in all this discussion the same quality standard is met. If you improve the tool, or show the man an easier way, you adjust the allowance downwards.

You always check performance against estimate. As far as we can see, this is the basic principle for measuring the efficiency of your maintenance force. A report on maintenance budget performance does not necessarily check *efficiency*. It only tells you how close you have come to an *expenditure* goal. The only clear measure of work is rate of output.

How can one measure the rate of output of a maintenance worker? Well, you pretty much have to check each job. Why not? You do it in production work. In maintenance, as in production, you can base the time allowance on guesstimate, past experience, or scientific work measurement. The last method, still little used in maintenance, is the most reliable yardstick. Any of these methods can be applied to production-type jobs, such as installing a pipeline, or sweeping a floor.

When it comes to service-type activities, such as storekeeping, truck maintenance, or water plant operation, the usual work-measurement techniques are impracticable. In such cases a so-called "utilization index," developed recently at Pearl Harbor, may serve as an over-all check. (See "Management Techniques Cut Maintenance Costs 20%," FACTORY, December 1952, p. 122.)

Here's how such an index is developed:

1. You assign a unit of measurement to your maintenance function *that relates the effort directly to work-load or output. Example:* man-hours of total craft personnel (for storekeeping), number of trucks (for truck maintenance), or gallons of water pumped (for water-plant operation).

Turn the page

2. Then you derive a performance rate over any regular period of time by dividing the number of man-hours applied by the units of work completed in that time. *Example:* 320 hours of storekeeping labor are needed to serve a craft personnel of 100. Performance rate is 3.2 (320÷100). It's an abstract rate.

3. To get the utilization index, you now select a fair standard-performance rate. The utilization index is computed by dividing this "standard" rate by the actual performance rate, times 100.

An index above 100 indicates above-average productivity of labor, assuming no change in quality of performance. Below 100 means inefficiency.

At Pearl Harbor some 36 utilization indexes were set up to check all major maintenance operations. They have proved helpful barometers of maintenance efficiency. They consistently reflected improvements caused by methods studies, planning and scheduling of work, and preventive maintenance. They disclosed inefficient operations that needed and got attention.

YARDSTICK NO. 4 • TO MEASURE . . .

Quality of Maintenance

How does anyone check the quality of any job? By physical inspection for defects. And by performance tests. In principle, it's as simple as that to check quality of maintenance.

INSPECTION • Maintenance supervisors make up the first line of inspectors. It's up to them to see that each job is up to standard. In production work there are always clear-cut, written specifications to use as a yardstick. Not so in maintenance, although industry is learning to develop and use standard-practice instructions for each type of job.

Sometimes the standards vary. You may have to be satisfied with less than a perfect job. To illustrate: While visiting a large aircraft plant, I noticed a sloppy painting job on one of the walls of the large entrance. Several weeks later I found it still there. The plant engineer was quick to notice my puzzled expression. He said:

"You're probably wondering why that wall looks so terrible. Well, we know it's a temporary job. We're planning to remove it any day now and build a permanent wall farther back."

Good supervisory inspection while the crafts are working on a job is the best way to assure high-quality work.

More and more we hear plant engineers voice this conclusion. But don't overlook the production technique of final inspection. Some plants have a permanent inspection corps reporting directly to the administrative branch of maintenance, usually near the top. This corps is responsible for all preventive maintenance inspections as well as "conditions" and "quality of performance" inspections. The inspectors are specialists, as in production, who know what to look for and what remedy is needed.

The maintenance executive himself makes a top-notch inspector. One plant engineer says (and I know there are many like him):

"I make a daily tour around my plant. Never miss. It's pretty fast sometimes, but my experienced eye can see what's going on. More than once I've caught bad jobs, or mistakes in the making. It keeps my men on their toes."

PERFORMANCE TESTS • You can get a clue to how well you are doing in maintenance by how well the plant is running. If production is high and of good quality, that's a good sign.

Here are some specific performance yardsticks by which you can measure quality of maintenance:

• **Production quality reports.** Often poor maintenance is the cause of poor quality. You get a better over-all view from a summary report than from the individual kicks.

• **Mechanical downtime reports.** They pinpoint the places where quality needs to be improved—by better design, or more frequent servicing. But don't depend on them as positive proof of good maintenance. They only tell you when it's bad.

• **Frequency of repairs.** Whether data on repairs are part of your equipment records or part of a special periodic report, an analysis of repetitive repairs can highlight areas of poor maintenance. We mean *all* repairs—to buildings and facilities as well as machinery.

• **Reasons for repairs.** We haven't seen this yardstick in much use as yet. It can be a powerful tool. How would you like to see a weekly report on your desks, Mr. Plant Manager and Mr. Plant Engineer, giving a code breakdown of the reasons for every significant repair in your plant? A category on "insufficient lubrication" would point to the quality of the lubrication function. Categories on "motor failure" and "corrosion" would call for better preventive maintenance. A code item such as "operator abuse" would place that blame where it really belongs—on production.

• **Safety reports.** These reports can reveal poor plant conditions—poor lighting, bad floors, uncovered steampipes. The possibilities are legion.

• **Production department reports.** Here's a technique any plant can use—no matter how small. We got the idea when we asked an executive the question: How would you check on maintenance

quality? He said: "I'd go to all the production supervisors and ask them." How right he is! An easy way to do it is to send out a weekly (or monthly) questionnaire to all departments as to progress of maintenance in that period, asking: Do any physical conditions need attention? Is the department being served well, fairly, or poorly? Any complaints? Some plants get the answers by weekly pow-wows between production and maintenance supervisors.

YARDSTICK NO. 5 • TO MEASURE . . .

Amount of Maintenance

Forgetting, for the moment, management's influence on the quality of maintenance, every maintenance executive faces this big question:

"How do I know whether I am over-maintaining or under-maintaining, or doing just the right amount?"

The maintenance executive knows the size of the job and the force needed to do it. He knows the efficiency of his force and the quality of its work. But is the maintenance goal set too high or too low? There must be a point of diminishing returns, where good maintenance doesn't pay off. How does one locate it?

We discussed this problem with Commander R. S. Stewart, whose Pearl Harbor maintenance program was reported in FACTORY, December 1952. We think he has a good clue to one way to solve it. In fact, he has applied his theory to the maintenance of automotive and weight-handling equipment. And he says it works.

Stewart labels his yardstick a "casualty frequency index." For example, this index for automotive equipment shows the number of repair jobs (maintenance) per 100 gallons of fuel (operations) per month. There are many other similar indexes. Each index covers only one type of repair on one type of equipment.

For example, there is an index for repair of front springs, one for adjustment of brakes, and one for cleaning of the radiator. Each of these is separately developed for a jeep, a ¾-ton truck, or a sedan.

In other words, this index reflects the number of times a certain repair is needed on a certain piece of equipment. And it automatically adjusts itself to actual operations—fuel consumption, in this case—to allow a fair comparison.

HOW IT'S APPLIED TO PREVENTIVE MAINTENANCE • Here's how this index guides the level of maintenance. Pearl Harbor has set up a preventive maintenance schedule on automotive and other equipment. Maintenance jobs outside the schedule are called non-scheduled jobs. They may be either emergency jobs required to repair breakdowns or interim jobs to prevent breakdowns.

By a careful coding of each type of job and hours on its work orders, Pearl Harbor is able to develop a card record of casualty frequency indexes. This record itemizes monthly for each index the number of jobs, total hours, and average hours per job for three types of jobs—scheduled, interim, and breakdown.

The cards are analyzed each month for trends in the size of the index as well as for relation of scheduled to unscheduled jobs. Normally, when the ratio of unscheduled to scheduled is high, it means that a particular item is being missed at scheduled inspections. So Pearl Harbor adjusts its time-tables or mileage tables on the inspection checklist to increase the frequency of inspection.

Conversely, if the ratio is low, it usually indicates over-maintenance, and the desirability of stretching out the inspection or servicing period. But, since the casualty frequency index is a measure of maintenance cost, this, too, must be watched. So you have to cut and try. The index tells you in which direction you should go. You gradually settle down to the practical minimum.

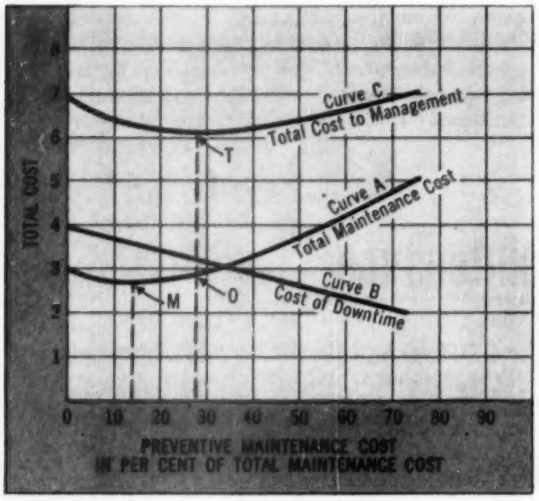
This analysis procedure at Pearl Harbor takes about 10 man-hours a week, with tabulating equipment. Since its application, there has been a consistent reduction in maintenance costs without loss of quality of performance.

WHAT ABOUT OTHER MAINTENANCE? You can enlarge this application, says Stewart, to any kind of maintenance. To show you how, we'll develop this theory on a broader basis.

In his statistical studies of the casualty frequency index, Stewart found a pattern of maintenance costs as described by curve *A* in the graph shown on page 132. This graph plots the total cost of maintenance—labor and material—against the cost of preventive maintenance expressed in per cent of total cost.

The maintenance cost (curve *A*) is the direct cost — cost of planning and doing the work. It represents the character of costs when preventive maintenance is shifted from zero, or "breakdown" maintenance, into high gear. The shape of the curve is insignificant and differs for every function. You'd have to plot your own. But all curves, Stewart discovered, have the same characteristic of dropping off as preventive maintenance is added, and turning up at the higher end of the "per cent" scale.

Now look at curve *B*. This represents the cost



of production downtime. It may not be a straight line each time — we've made it so for simplicity. But it's usually highest at zero preventive maintenance.

Downtime cost can be a big factor in some industries. It needs to be added to maintenance cost to get the over-all cost to management. This over-all cost is curve *C*.

These simple curves answer in principle the question of how much or how little maintenance to do. You can't develop them overnight. You need to collect a lot of data at different levels of maintenance. But here's what you can learn from them:

1. Minimum maintenance cost. It's point *M* on curve *A*, the lowest on the curve. In this case a 12% expenditure in preventive maintenance costs is sufficient. Above that, maintenance costs rise because of more frequent servicing.

2. Minimum total cost. This is point *T* on curve *C*. It's the point where less maintenance, even at lower cost, will boost downtime costs in greater proportion. And where more maintenance will cost more than the saving in downtime is worth. In this case, a 28% expenditure in preventive maintenance pays off the best. This is the optimum to which the casualty frequency index guides you.

These typical curves help to explain the cause and effects of management policies on the maintenance cost picture. For example, it's evident that the minimum maintenance cost (point *M*) is less than the optimum cost (point *O*) when other cost factors are involved. On production machinery curve *B* represents downtime. On buildings and other non-productive facilities curve *B* may represent loss in output because of lower worker efficiency.

Efficiency can be cut by poor lighting, ventilation, or housekeeping. It can be boosted by stimulating worker morale with freshly painted workrooms, clean washrooms, well-kept grounds, and flower beds. Industry hasn't reached the point yet where it can plot curve *B* accurately for these and other influences. But the evidence of their existence is piling up, and we know they affect curve *C* (total cost to management) in a substantial way.

The lesson we can learn from these curves is this: It's the plant engineer's job to decide which maintenance procedures place the maintenance cost at a minimum (point *M* on curve *A*). The tracing of curve *A* is strictly an engineering determination, based on knowledge of maintenance requirements. Other plant operating executives and top management must help the plant engineer develop the "manufacturing" cost of operating at points along curve *A* as typified by curve *B*. In short, determination of the optimum cost, point *O*, is *everybody's* job.

Top management, of course, decides whether it can afford to go higher in its maintenance budget than point *O*. Painting the plant every year instead of every 3 years is an example of a practice that needs extra justification, such as public relations. Sometimes management wants to defer maintenance below the minimum (point *M*). In either instance, it should do so with its eyes open to the facts.

These facts it can get from the plant engineer or maintenance executive. It's his job to keep management informed of the cost of deviations from the point of optimum maintenance that result from management policies. If management insists on cleaning the grounds daily instead of weekly, it should know the price. If management doesn't allow enough manpower to check critical equipment every day, it should be told the penalty.

From there on it's management's decision. Many plant engineers are not getting wise management decisions because they haven't given management the facts typified by curves *A*, *B*, and *C*.

None of these curves is static. Obviously, changes in cost of wages, materials, and downtime will shove them up or down. Better management of maintenance and improved methods will lower the curve along its entire length. Smart plant engineers are saving their companies money just that way.

WHY NOT AN OVER-ALL INDEX?

Industry wants an over-all index of maintenance costs. It would simplify the preparation of estimates and budgets.

We have talked with many plant economists about the problem. So far no one has boasted of a perfect solution. A recent answer is typical:

"We've plotted all kinds of data, tried all sorts of correlations—with output, personnel, investment, depreciation, utilities consumption, and many

other units. But we haven't found a dependable index."

One thing seems quite certain. It there is such an index, it will have to be developed singly for each plant. You won't be able to pick one out of a book.

Some plants are using indexes such as the following with more or less satisfaction; others say they can't use them because of poor correlation with their own operations:

- Ratio of maintenance labor to total personnel.
- Percentage of cost of finished product or of sales.
- Maintenance expense per thousand dollars of investment.
- Operating hours.
- Power or steam consumption.

There are many more. Basically, they are all derived from historical data accumulated over a period of years. You wouldn't dare lift an index from another plant to use as your own.

HOW ABOUT A BUDGET? A budget can make an excellent over-all yardstick if it is carefully drawn to reflect operating needs. But you must still accept the fact that it's a self-imposed yardstick. Usually it's a sum total of money or man-hour goals a plant sets up to control its over-all maintenance cost. These goals are established on the basis of a breakdown of maintenance functions and responsibilities into as many predictable factors as possible.

Now let's see how lots of plants set their budgets. They use historical data. They seek correlations. They build the budget, in parts at least, by resorting to self-made indexes. These indexes, however, will certainly fail if the historical data are wrong. As one engineer reminded us:

"We can't develop a reliable budget for several years to come because our maintenance costs of yesterday included a lot of stuff that wasn't maintenance. You have to get reliable figures first."

You *do* have to get them, if you use the historical method to develop a budget. And then you have to correct or adjust those figures to current values in wages, material costs, improved methods, new tools. Also, you have to reappraise the job for additions or deletions. A more forward-looking procedure, suggests the National Association of Cost Accountants, is to begin with a physical survey of the projected work and then convert the requirements into dollars and cents.

This brings you right back to the basic methods of developing yardsticks as described herein for the size and quality of the job, manpower, efficiency, and level of work. And if the plant engineer breaks his budget down into (1) necessary maintenance (point *M* on curve *A* of the graph), (2) optimum maintenance (point *O* on curve *A*), and (3) desirable or optional maintenance (any point beyond *O*), he's giving management the information it needs for intelligent decisions. And he's more likely to get favorable decisions.

WHAT SHOULD MAINTENANCE COST?

By now it should be plain there's no pat answer. There is strong evidence that industry may be looking at this problem of maintenance costs at the wrong end, both in its cry for an over-all index, and in its hope to control maintenance costs by setting lump-sum goals.

If we are to learn anything from the best maintenance programs we have seen, it doesn't work that way. These programs attack the problem from a scrutiny of the *costs of small segments* of the total. They break their costs down to single functions, single machines, single services. They find out what these costs are, and use the many yardsticks we have described to uncover places for improvement.

As one maintenance executive puts it:

"We tried to relate our total maintenance costs to an index such as plant investment, output, and kilowatt hours. We found that the variety of functions—building maintenance, machine maintenance, steam plant services, and the like—didn't yield to a common denominator. When these functions were broken down, however, to where we could compare apples with apples, and pears with pears, we began to see that such comparisons made effective performance guides."

He had emphasized in different words the principle behind the utilization index used at Pearl Harbor!

It all boils down to this: You can set up yardsticks to guide your maintenance activities. But no one yardstick will do it. Also, no yardstick of itself will reduce your costs. It will only tell you where you are, and in what direction you should go to cut costs.

How do you cut maintenance costs? By a good maintenance organization, good administration, and a good paperwork system. By improving the skills of personnel, and providing efficient workplaces and tools. By improving materials, methods, and procedures. By proper management policies, production cooperation, and proper incentives.

The survey beginning on page 114 tells you to what extent industry is using these techniques. No one technique alone will promise the lowest cost. You must use all of them. That's why FACTORY believes no single yardstick will ever suffice to give you the answer.

These techniques are all good yardsticks of the quality of a maintenance organization, though we don't claim to have searched every corner of the subject. As time goes on we expect industry to develop more and better yardsticks. But of this we are sure—these yardsticks will always have to be tailored to the individual plant.

By J. W. ST. ANDRE • Electrical Editor, FACTORY

When maintenance costs look high . . .

Don't Tear the Hide Off Your Plant Engineer

Hold off at least until you're dead sure he isn't being asked to do things he shouldn't. Things that can knock his costs for a loop. Things like . . .

. . . "government work"

What kind of work comes under this classification? Well, such jobs as:

- Fixing a toaster for the president's wife.
- Making signs for the bowling league's banquet.
- Repairing a camera for the production manager.
- Straightening out the bumper on the plant manager's car.
- Setting up a PA system at the board of directors' dinner for a visiting celebrity, and providing a standby electrician to operate it.

Why does the maintenance department do this work at all?

Put yourself in the maintenance superintendent's shoes. These requests come from people who rank him in the line organization, or from men he has to work with every day in the year. It's not such a hot idea to refuse a request made by the president or general manager—if you can actually do the work. And doing a favor for the production manager may mean he'll cooperate more closely with your preventive maintenance schedules.

Don't get me wrong. I'm not defending the practice of doing this "government work" on company time. I agree it should be abolished. But let's not kid ourselves. These jobs go on in every plant.

Usually the practice can be traced back to "top brass." It's tough for the maintenance superintendent to enforce a "no government work" rule when requests come down from the top. Management should either stop this practice or else provide some way to allocate the charges so they won't make the maintenance department look bad when its efficiency is being measured.

. . . making things you ought to buy

Another sure way to run up maintenance costs is to make things that shouldn't be made.

Example No. 1: The plant manager wants a table made, just so. He can't find such a table on the outside. Nobody in his right mind would design such a piece of furniture. But the boss wants it, so the maintenance department has to make it.

The costs of such an item are almost sure to be fantastically high. You could probably buy three standard tables for the cost of one such special table made by the plant. And the charges, needless to say, are made against the furniture repair account.

Example No. 2: The production department needs all sorts of tools. Maintenance has a machine shop. So maintenance makes the tools. I'll grant you that you may have a separate account to charge off such work. But it still is a maintenance charge and goes in as such when any comparisons are made.

Why do such things happen? Because in many plants it's a whole lot easier to put through an order to have the maintenance department make equipment than it is to wade through all the paperwork with the authorizations required to buy the equipment outside. In most cases, the cost of making the article yourself far exceeds the cost of buying it outside.

Another point to consider is the fact that most maintenance departments do not have the equipment or the manpower available to do this kind of work. You may actually be robbing your plant of maintenance work that will reflect in higher maintenance costs later on.

Example No. 3. One plant I visited some time ago bragged about saving $8000 in constructing a high-voltage substation with its own electrical department instead of using an electrical contractor. The electrical department consisted of *one* electrician and two helpers.

It took them three months to do the job. Meanwhile no electrical maintenance whatsoever was done in the plant. One week after the job was completed, a controller on the main paper-making machine blew up and shut the works down for two days while repairs were made.

Cost of a new controller was $3000. Loss of production amounted to over $30,000. Proper maintenance would have saved the controller and avoided the shutdown. Do you think this company saved money on the deal?

One other point to consider: Even if you capitalize this new equipment you make in your own plant, the excess cost over the same item bought outside may make it impossible to charge off the whole amount. So the excess cost has to be absorbed somewhere. You guessed it—the maintenance department has to take it.

So . . . don't burden your maintenance department with the task of making equipment that can be bought outside for the same money or even less. Make it just as tough to get an order through to make these items in maintenance as it is to buy them on the outside.

If you *do* have to make equipment in your maintenance department, make sure the department has the right tools and facilities to do the work. Make sure, too, the manpower is available and that it won't be necessary to put off maintenance work you need; that will increase your costs later on. And don't forget to make allowances for the extra demands on your maintenance department when you start to compare its costs with those of the plant down the street.

. . . unfinished business

In these days of rising costs of materials and wages, more and more construction projects are exceeding appropriations. This is especially true when the projects drag on over a period of time because of shortages or delayed deliveries.

When outside contractors are involved, some managements are getting into the habit of terminating the contract and finishing the project with their own maintenance department.

Fine. But where does the extra money come from? If there wasn't any money left to pay the contractor, where does the maintenance department get off? In nine cases out of ten, it takes the project on maintenance charges. This is bad in two ways:

First, the maintenance department has to accept charges that do not belong to it, over which it has no control. Second—and this is worse from a management standpoint—the asset value of the project is not shown in its true amount. You may have a $250,000 building on your books that really cost $300,000.

Example: In one plant I know of, a project involved a building for testing compressors. As so often happens, the test engineering department had to make changes in the plans after the building was under construction. Some of these changes were necessitated by errors in judgment, but most of them were caused by changes in product design.

Management didn't want to go to the board of directors for additional funds. So the contractor was let go with only half the project completed. Maintenance had to take over and absorb $40,000 to complete the building. Yet at this same plant, the plant manager is always complaining that his maintenance costs are too high.

TIGHT ESTIMATING • This should be the objective of a good maintenance department. But the best-laid plans can go astray because of increased material costs or necessary changes in plans. The management that just about tears the plant engineer's hide off every time he has to ask for additional funds on a project, no matter how justified, will soon find that all projects stay within appropriations. But either maintenance costs go up or else maintenance is deferred until later, often with disastrous results.

TIGHT BUDGETS • Some plants are now working on monthly budgets that are tied in with production output. The plant engineer caught in such a set-up is faced either with laying off men to cut his budget or reducing the amount of maintenance in order to cut down on materials.

Laying off men involves much paperwork, union restrictions on lay-offs, seniority, and pretty good assurance that any good mechanic laid off will be snapped up by another company. So the only alternative is to cut down on maintenance work until the whole plant comes down around the plant manager's ears.

Tight budgets also encourage cannibalizing of parts from idle machinery. The plant engineer is firmly resolved to replace the "borrowed" part as soon as he gets caught up on his budget. Somehow that day never seems to come around. So it's a rat race—often accompanied by high costs—to get equipment in running order when it is needed once more for production.

Example: One plant had five testing sets worth $1500 apiece on the books. A check in the plant located the sets in a dark corner. All that was left was four pieces of sheetmetal (the enclosing case) mounted on four legs. Everything else had been stripped from the equipment and used to cut maintenance corners somewhere else.

Who did it? Everybody blamed the other fellow. But the plant engineer on the job at the time the equipment was needed had to foot the bill. Just another example of why maintenance sometimes seems so high.

* * *

The above cases have actually happened in plants. They may still be going on right now in your plant. If they are, either correct the circumstances that create these conditions or be prepared to accept high maintenance costs. Blaming the poor plant engineer when it probably isn't his fault won't get you anywhere. And you can be sure it won't lower your maintenance costs.

TIPS TO GOOD HUMAN RELATIONS for factory executives

By M. J. MURPHY • Industrial Relations Editor

BRAND-NEW WAY TO CONDUCT WAGE SURVEYS Ever think of conducting a wage survey by the *conference* method? Doesn't sound at all practical, but it works fine, says the California Institute of Technology's Industrial Relations Section. It's much better, easier, and faster than the usual methods of mailed questionnaires or personal visits, they report. Big trick is to make all the preliminary conference arrangements right. Do that, and the plan promises to be sure-fire.

No room to describe details here. Why not write the Institute (at Pasadena, Calif.) and ask for Circular 20, entitled "Conducting a Wage Survey by the Conference Method." In four condensed pages Authors R. A. Nelson and L. R. Sorenson manage to pile up a lot of practical how-to-do-it guidance.

ADVICE ON LATENESS Lots of plants now grant a short "grace period" at the start of work. During this time—from one to several minutes, workers may clock in without being penalized for lateness. Trouble is, though, that workers can easily lapse into the habit of taking full advantage of the grace period. That's bad, especially where you don't want to have to take away this minor but helpful little benefit.

Here's a nice way of highlighting the problem without threats. It appeared recently in *Firing Line*, the employee magazine of Raybestos Division, Raybestos-Manhattan, Inc., Bridgeport, Conn.:

"**Question:** My foreman expects me to be on the job at 8 a.m. Aren't we allowed a 7-minute period for punching in after the start of our shift?

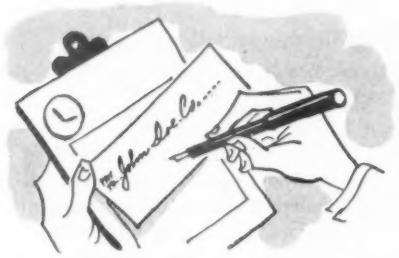
"**Answer:** Yes, it's true we do allow an employee to punch in before eight minutes past his starting time, and not be docked any time. But this is a privilege given by the company to cover extenuating circumstances and is not to be abused by habitually punching in late. Your foreman is correct in expecting you to be on the job at the regular starting time."

ONE WAY TO BOOST PRODUCTIVITY Everybody's interested in increasing employee productivity or output per man-hour, or whatever you call it. Here's an interesting commentary from McGraw-Hill's correspondent in Australia on one way to do it. We certainly can't recommend it for the U. S. But it does throw a highly significant light on the relation of even a small dose of unemployment to attitudes toward output where the economy is tightly controlled:

"The Australian equivalent of our Tariff Commission has recently investigated the relation between full employment and output per man-hour. It discovered that a small dose of unemployment resulted in a 30% increase in labor productivity.

"The investigation is of extreme interest be-

cause Australia was until recently one of the very few countries in the world with absolutely full employment. During the full-employment period, when manpower was very difficult to obtain, productivity was notoriously low. In recent months the economic conditions changed somewhat, and at present there is 1% to 2% unemployment."



WHAT'S SPECIAL ABOUT YOUR TIME STUDY MEN? Here's an interesting and challenging way to look at your time study men. It certainly explains fast why it's worth some real effort on your part to see that they're among the best-selected and best-trained men in your plant.

"A time study man is a fellow who signs a company check every time he sets a production standard. It's higher management's job to see that he doesn't sign a *blank* check."

So says Phil Carroll, who's qualified to talk after years of consulting experience in which he has trained hundreds of time study men.

THIS HARD-HAT PLAN WORKS—AND PAYS OFF For several years American Smelting & Refining Company has been encouraging the wearing of hard hats in its plants. Cartoon shows what happened to one of 10 men the company recently identified to highlight the importance of the results of its efforts. The brick that bounced off this man's hat would have seriously injured him—maybe killed him—if it had bounced off his head instead. And, had he not been wearing his hat, the cost of his injury or death *would have exceeded the entire cost of the company's hard-hat program in his plant!*

The same thing's true of each of the 10 cases, reports R. C. Beckstead, director of safety and technical employment.

Worth doing? Obviously, says Beckstead. And it's easy to do. Hats are supplied to workers free. In cold weather they also get liners. To encourage wearing hats, the company inspects them regularly and services them completely, including a disinfecting wash. In addition, there's a constant educational drive, with lots of publicity for every case where a hard hat prevented an injury.

That's the whole plan—nothing "plushy" or fancy about it. But it works, and pays for itself to boot.

ABSENTEEISM DOESN'T PAY OFF Here's how Jack & Heintz, Inc., Cleveland "talks turkey" about absenteeism in the *Associator*, J & H's monthly employee magazine. It's refreshingly free of "preaching," may give you some ideas for your own plant paper:

"Absenteeism is an expensive habit. When you stay away from work, you lose money. And that's money you can never make up.

"Let's take an example. Supposing you earn $1.85 an hour and you are absent from work only three days a month. That costs you $44.40 a month. What does this amount to at the end of the year? It will total:

"The down payment on a new car.

"A set of living room furniture.

"A grand vacation for your family.

"The remodeling job you've planned on your house, or a sizable reduction on the mortgage, if you're buying a home.

"The finest TV set in town.

"A comfortable increase in your savings account.

"Best investment of all—over $500 in Defense Bonds, which would net you well over $625 at maturity."

How to Revise an Incentive Plan —and Live Through It

By HARRY LEE WADDELL • Editor, and ROBERT S. RICE • Industrial Production Editor, FACTORY

In this report the employees of Auburn Spark Plug Company tell us what they think is right and wrong about revising incentives. If you're thinking of changing a plan that's gone sour, you'll find their ideas helpful.

EVER HEAR of "creeping changes" converting a smooth-working incentive plan into trouble? Probably you have; it's a common problem. It's a serious problem, too, because it won't go away. It hangs around your neck and gets more serious as time goes on.

But the *real* problem is how to revise a plan that's gone sour without creating more trouble—maybe even a strike.

We heard that Auburn Spark Plug Company, Auburn, N. Y., had licked this problem peacefully and successfully. Then we found the company so pleased with the way the revision came off that it opened its doors to us. Its management talked frankly about the problem and the solution. Then it gave us the run of the plant to question employees freely. That's why we feel this report can help you with your incentive problem.

Auburn Spark Plug's problem

Regular company-union meetings found more and more time devoted to complaints about the old incentive plan. The plan covered three production departments—single-spindle screw machines, multiple-spindle screw machines, and "second operations" (drill, mill, burr, etc.). Two other production departments were not included—still aren't. The incentive system covered about 38% of the shop employees—about 65 out of 170.

Installed by a consultant in 1945, it was successful until an accumulation of changes made it less and less effective.

EMPLOYEES COMPLAINED • On some jobs an operator couldn't earn much bonus because the standards were too tight. On other jobs an operator could make good performances (perhaps because of loose standards), but his bonus wasn't in proportion.

The old plan paid in direct proportion to performance (straight piecework type) up to 130%. Above that, the additional bonus was 50% of the extra performance.

• **Some operators thought they should have earnings opportunities equal to the operators of the new high-speed single-spindle machines.**

In some mysterious manner an extra allowance for "backlash" got into the standards for the new machines. It put their operators on the "gravy train."

• **Employees wanted to earn more money.** But the change in bonus percentage at 130% performance acted as a brake on initiative to produce.

COMPANY COMPLAINED, TOO • It wanted to increase earnings opportunities to improve its attractiveness as a place to work. Its wage rates compared favorably with its business competitors whose production machinery is practically all automatic screw machines. But those competitors are outside the area from which Auburn Spark Plug draws its employees. For labor, the company must compete with other industries in and around Auburn, some of which appear able to pay higher wage rates.

But the company couldn't give a flat increase in wages because of Wage Stabilization Board rules. Also, competition wouldn't permit the company to increase its manufacturing costs.

• **Believing it takes employee-management harmony to realize efficient, low-cost operation, the company wanted to eliminate the grievances over the incentive plan.**

Employees and management agreed the solution of their mutual problem was obvious—a revision of the incentive plan. The company employed a management consultant to do the job. The revised plan has been in use approximately a year—long enough to be certain it's working satisfactorily. But its importance is not so much in the fact that it was accomplished as:

How the plan was revised—peacefully

From our discussions with the management and employees of the company, we believe the main reasons for success in handling the revision are:

• **Both management and the employees had**

Auburn Spark Plug Company has an interesting way of handling the problems of pay differential between incentive and non-incentive employees. It has two basic wage scales: One for incentive labor, and one for non-incentive labor. The differential increases from the lowest to the highest labor grade:

Labor Grade	For Non-Incentive Jobs Hourly Rate Range	For Incentive Jobs Basic Rate Range (Incentive Bonus Added)
10	$1.01 — $1.15	$0.96 — $1.075
9	1.07 — 1.195	1.005 — 1.12
8	1.125 — 1.265	1.055 — 1.18
7	1.195 — 1.40	1.105 — 1.235
6	1.315 — 1.56	1.15 — 1.295
5	1.405 — 1.685	1.22 — 1.38
4	1.485 — 1.78	1.30 — 1.445
3	1.575 — 1.915	1.355 — 1.535
2	1.635 — 1.985	1.43 — 1.60
1	1.725 — 2.10	1.49 — 1.68

confidence in each other, based on long-term friendly association.

During our conversation with Kenneth Miller, president of the union local (United Auto Workers —AFL), he said: "Charley told us he wanted to increase our earnings, and he explained why costs had to be held down, too."

"Charley" is C. J. Nolin, president of Auburn Spark Plug. And the way Kenny said it, we felt it was just open and shut that there was both truth and belief in the statement.

One of the operators told us she had trouble, at first, with the difference between the old and new plans in the way they handled allowed time. Said she wrote delays into her time ticket as she had always done, only to have most of them crossed out. She asked for an explanation, and got it. **The new standards cover delays that weren't included in the old standards.** She wasn't sure she understood the technical detail. But she was "sure the company has worked out the standards fairly, and that I'm getting paid properly."

• **The consultant carefully sold himself and his work, step by step, to both management and employees.** (In your case the "consultant" might be one of your full-time industrial engineers.)

Actually, "sold" doesn't adequately describe what this man did. The esteem in which everyone we talked with at Auburn held "Art" seemed to indicate he had mesmerized them. At one and the same time he was "one of the boys" and a respected, capable judge of what was fair to both management and employees.

One of the machine operators told us he had taken the consultant home to dinner—said: "He was good company, and told me a lot about incentives after dinner."

During the first couple of weeks the consultant was on the job he spent practically all his time talking with the employees. He listened to their gripes about the old plan, their suggestions for a new plan; and he discussed with them his ideas about a new incentive plan.

When the time came to present each new plan (one for each department) to the employees, the consultant attended union meetings to explain the plans.

Incidentally, *all* employees at the union meeting voted on acceptance or rejection of a departmental incentive—not just those that worked in the department. According to the union president this unusual procedure was adopted for two reasons: (1) The possibility of interdepartmental transfers gives many employees a stake in the incentive proposal for any one department; and (2) all employees had an interest in removing interdepartmental inequities.

During the trial period of applying the new incentives, the consultant made himself available in the shop to help the foremen explain details and check performances. Also, working informally, the consultant handled many questions directly. Such was the confidence of management and employees.

We realize that "selling yourself" is just about as old a principle of industrial engineering as the first textbook on the subject. But don't second-rate it. Nearly all the employees we talked with emphasized that the approachableness and frankness of the consultant were major factors in getting the new incentives installed peacefully and quickly.

• **To make up for their lack of complete understanding of technical detail, the employees depended on a trial application of changes in the plan.**

Can a company eliminate explaining the make-up of an incentive plan to the employees? No, said the workers at Auburn to whom we put this question. They wanted, and got, a thorough review of how time studies were made, how allowances were determined, and so on. They admitted they didn't understand all the details, but they wanted to hear about them.

There was evidence of this interest on the bulletin board of one department. On a single sheet of paper was all the arithmetic of a time standard, including actual time, performance rating, allowances, etc. The foreman said it helped him answer operators' questions.

But all the employees we talked to said the only way to *really* see how an incentive is going to work

HOW TO REVISE AN INCENTIVE PLAN . . . *Begins on page 138*

is to put it in and try it. "Trial application" to a past period won't do. Most operators feel they can't remember the work they did last month, or 3 months ago, well enough to use it as a measure of a new incentive. They want to try a new incentive by applying it to current work—for at least 4 weeks.

In this case the company put the new incentives into effect, replacing the old ones, as the employees voted to accept them on a trial basis. The trial lasted 3 months. During the trial period nearly everyone kept his shirt on—because of confidence—and quietly worked out the wrinkles.

A few newer operators quit when the new incentive was applied to the high-speed single-spindle machines. They're the machines that had the "gravy factor" in the old standards. The new standards were generally tighter, and at first the operators earned less money—or didn't get more for increased output, as did other employees.

But the older employees had confidence, and stuck until the problem was solved. They told us they're satisfied they stayed because they're doing all right now. They recognized the looseness in the old standards. But, shortly after the trouble arose, the company revised the performance-bonus scale to give the operators an incentive to boost production—increase earnings and hold down costs.

In general, the performance-bonus scales for all departments are the same. They are tables showing the bonus in cents per hour for each 1% of performance between the norm, 100%, and the ceiling performance, 150%. At most steps of 1% increase in performance the bonus increases 1¢ per hour. But, at selected steps of 1% increase in performance, the bonus increases 2¢ per hour instead of 1¢.

The scale for the automatic screw machines has more 2¢ steps than the scale for the secondary department. Also, the last step—from 149% to 150% performance—is a 4¢ bonus increment for the automatics. In effect, the bonus curve for the automatics is steeper than that for the secondary department.

During the trial period the company did not post a comparison of old and new plans—only performances on the new plans. But, if an operator wanted to compare, his foreman or the consultant helped him make the calculations.

What about the next time?

Auburn management says there won't be a "next time" for a complete revision, if it can be avoided. The company plans—and the employees know it—to have a consultant audit its incentives within 2 years. It hopes to discover and correct for the "creeping changes" before they make a general revision necessary.

A TOBY QUINT EPISODE:

The Perfect

By RAY W. SHERMAN

TOBIAS QUINT, PLANT MANAGER of Central Manufacturing, came and went in odd ways. Sometimes he liked to tramp over the ties to the shipping platform and come in through the plant.

Smell of the factory seemed to give the day a better start. What the aroma was made up of, he couldn't tell. But, like everything, from a foundry to a pickle works, the plant had its smell, which hadn't changed any since he worked on a bench.

Through his leathery wrinkles Toby smiled "hello's" among the machines, but slowed near the glassed-in office of Joel Bede, superintendent of Production B, where a super-finger was waggling across the desk at Plant Engineer Jack Dean. Dean shot out the door just before Toby got there and scowled off in the other direction, his long legs swinging.

Toby thought a cheerful "Good morning, Joel"

"They're afraid they'd get a worse one."

Man

might do some good. It was a complete flop. Joel's face grew redder. His shoulders squarer. His jaws more set. Finally he busted loose:

"Toby! Of all the—! Oh, what's the use?" He wilted in frustration.

"I take it," said Toby, "something's wrong."

"Wron-n-n-g? Once I thought only foremen were dumb! Now it's got up into your plant engineer's department. If it keeps on going higher, I wouldn't be surprised if the Old Man forgot to worry about expenses!"

Toby uttered a many-meaninged "hm-m-m!"

Joel began to glare again. "There's a toilet leaking in K-L. The floor's a mess! The men are sore. Gets worse every day. Jack Dean didn't get to it."

"And—?"

"Dick Michel's sore. He called me yesterday. I phoned Dean to tell him to hold a couple of men and fix it for sure last night. Dean was out. I told his girl. He didn't come back till she had gone. She forgot to leave him a memo. Result? The floor's still a mess!"

"Hm-m-m." Toby stroked his chin some more.

"That isn't all!" Joel's voice rose higher. "Carpenters don't like saw guards. So they take 'em off. Bide Demarest has been foreman long enough to know that isn't done. Now we've got a ripped finger on our hands!

"That fire last week!" Joel went on. "Every foreman knows he's supposed to sound an alarm at first sign of a fire. So Tubby Jones grabs a fire extinguisher and tries to put it out himself. By the time he finds out he isn't a fire department it's bad.

"Goggles? All over the plant no goggles! Toby, Central Manufacturing has got more dumb birds to the square foot—"

"I know it's tough" Toby laughed. "We're asking you to build an organization with imperfect people."

"But do you have to hunt so hard to find that kind?" Joel growled.

"Don't let it get you down," said Toby. "Trying to build a bang-up organization out of imperfect people is why we have supervisors. It's part of your job. You and a number of other guys in Central Manufacturing.

"We train 'em, have meetings, point out mistakes, lay down the law, sometimes have to make changes. And when things slip, as they do, it's exasperating. Makes us want to fire the man. But, if we did, we not only might get a worse one, but we'd lose all we've invested in the man.

"You've got to take people as you find 'em, Joel. We can make all the rules we want to. But a man's first impulse will be to try to put out a fire and save the company's property. It was an expensive way to teach Tubby Jones.

"Dean's girl won't make that same mistake again. I'll bet Bide Demarest will have guards on everything for months to come. Then—" Toby shrugged "—they'll come off again. Indifference to safety is as old as man. The penalty of the free man is that he'll take a chance. There are no perfect men."

"Not in Central Manufacturing!" Joel snapped.

"Tell you what you do." Toby rose to go. "Save up till you get ten good mistakes. Then take 'em under your arm and come up my office and bawl me out good. I don't have anybody to bawl me out but the Old Man and the Board of Directors."

"Aren't thinking of firing you, are they?" asked Joel.

"Oh, no!" Toby grinned around the corner of the door. "They're afraid they'd get a worse one."

Almost every plant has or needs some sort of salvage program. Whether you can afford to apply only one part-time man to the job—or organize a separate salvage department—take a look at Dow Chemical's . . .

6-Point Program for Managed Salvage

KEEP THE SALVAGE ROUTINE in full motion. That's the rule that overshadows all others at Dow's Midland plant. Don't let any part of the salvage program bog down. When you allow any of the following six operations to stray from schedule or become spasmodic, you will end up with constipation in the flow and recovery of valuable proceeds.

Here's how Dow's plant superintendent, Norris E. Coalwell, puts it:

"Salvage operations at Dow Midland are based on this premise: Any operations that do not show a profit or are not self-sustaining are not carried on. Our returns from salvage are more than just dollars-and-cents income on materials we sell.

"We re-use what we can. Often we draw hard-to-get items from our salvaged stock that we couldn't get from manufacturers except on long delivery. Items thus available on immediate call cut downtime. And every time a piece of equipment or material has been reclaimed, its cost is considerably less than a new item.

"But unless the program keeps constantly moving—disposing of unusable items, reclaiming and re-conditioning usable ones—we lessen the chances of getting full value out of our program."

Below, and on the following page, are the six basic steps in Dow's keep-it-moving managed salvage program. FACTORY has briefed each for you. Then Superintendent Coalwell tells you *how* the program is put into profitable action.

1 · Organize the collection of discarded material

WHAT YOU CAN DO:

See that all production and maintenance departments are included. Instruct them all what to do with all obsolete equipment or waste materials. Don't confuse the collection of salvageable items with refuse materials.

HOW IT'S DONE AT DOW:

"Our production or operating departments decide when and what equipment or material is of no further use to them. Fabricated items are tagged for identification and listing of pertinent data. Other items are placed in a designated location. From here they are picked up daily and transported to the salvage department by an organized system of plant cleanup. Refuse and production waste are not a part of this system."

2 · Sort the usable items from the unusable ones

WHAT YOU CAN DO:

Both usable and unusable items have value. But what you can re-use in the plant is more valuable. If you let the stuff pile up unsorted, you end up with a hopeless jam. Then you have to sell everything as best you can to relieve the congestion. You are bound to lose some valuable items.

HOW IT'S DONE AT DOW:

"In any salvage operation you accumulate a certain amount of unwanted usable material. For example, we get iron scrap, steel drums, fiber packs, paper, rags, and obsolete equipment. These all have a disposal value.

"Our salvage department checks and classifies all materials it receives before unloading them. In determining the value of an item for re-use, it checks where it came from, former use, and safety precautions required. This is done before further handling or processing. Items held for re-use are assigned salvage numbers from a consecutive written record for each classification. Items ordinarily carried in stock don't get salvage numbers. Numbers and other data are applied to items by stenciling or by attaching fiber or metal tags.

"We send usable items thus analyzed to indoor or outdoor locations, depending on their nature, for more processing. Structural steel, for example, is kept outdoors; instruments are kept under cover. Scrap material is separated into salvageable and unusable. The unusable, also classified, is prepared for sale through various channels. The salvageable scrap is separated into five categories: steel and pipes; valves and fittings; alloyed metals; cast iron; and electrical wiring."

3 • Disassemble and recondition usable items

WHAT YOU CAN DO:

Nobody wants to use a reclaimed item not immediately fit for service. You discourage re-use of machine parts, valves, fittings, and so on if you don't make them ready for off-the-shelf use. A good engineer or maintenance foreman hestitates to modernize or revamp equipment when its condition is in doubt because it's covered with dirt, rust, or chemical deposits.

HOW IT'S DONE AT DOW:

"We do not run a junk yard. We operate a salvage or reclamation department in which all usable material and equipment is reclaimed one way or another. Our salvage department is operated in conjunction with our sandblasting department. It has 14 workmen, two part-time clerks, and three part-time supervisors.

"When usable items reach their appointed location, we follow a definite procedure somewhat like this: Units of a stock nature are cleaned up, reconditioned, tested, and made available for re-use. Units bearing salvage numbers are cleaned and protected to prevent deterioration. Craft shops do all the necessary reconditioning."

4 • Dispose of unusable items at highest salvage value

WHAT YOU CAN DO:

You can increase your returns from sale of unusable items by segregating them. Everybody knows that mixed metal scrap, for instance, gives lower returns than classified batches. But watch out that cost of segregation doesn't exceed the extra return.

HOW IT'S DONE AT DOW:

"We load into railroad cars that part of unusable scrap it doesn't pay to segregate. Any parts of equipment that are found to be unusable during cleaning or reconditioning are junked and sold as scrap."

5 • Store usable items so they are easy to find

WHAT YOU CAN DO:

Don't just pile reclaimed materials into any empty bin or corner. Unless you care for them as you do new inventory, they won't be touched. Some people won't know they are available—those who do know won't take the time to find them.

HOW IT'S DONE AT DOW:

"All usable items are card-indexed by trade name. Stock items of a like nature appear on one card, showing the number of items available. For items that bear salvage numbers, the cards contain all the data needed to evaluate the usefulness of each item.

"All cards show storage location of items. This index is part of our perpetual inventory system."

6 • Keep records of reclaimed items, and use them where possible

WHAT YOU CAN DO:

Reclaimed inventory that doesn't move might better have been junked in the first place. Encourage use of reclaimed material by keeping interested departments posted on what's available. Never order new equipment without checking inventory list of reconditioned items. And keep that list up to date.

HOW IT'S DONE AT DOW:

"Our salvage department lists in a running catalog all items it has reclaimed and preserved. Revised lists are sent about once a month to each department having possible use for materials listed. The same list goes to all divisions of the company.

"As a result, our stockrooms draw on these stock items regularly. The turnover of stock items is rapid. On the larger items and equipment, however, turnover depends on the demand. We make a periodic survey of slow-moving items. We don't believe in hoarding like squirrels until the stuff rots on our hands."

MODULE SHIELDS THESE MEN FROM THE USUAL DISTRACTIONS IN LARGE OFFICE AT CONVAIR'S SAN DIEGO PLANT.

For $35 a man...

Modules Make Semi-Private Offices

IT COST JUST $35 a man to solve the problem of disturbing sights and sounds in a large engineering office at the San Diego, Calif., plant of Consolidated Vultee Aircraft Corporation.

The solution is a system of 77 2-man modules created by 4-ft. partitions. The modules protect the 154 office workers from most distractions without isolating them. And they use 10% less space than the same facilities without partitions and with desks in conventional rows. The bill for labor and materials was $5400.

Convair set up the new system in the engineering department, but feels it's applicable to any large office, whatever the activity. The idea behind it: A seen-and-heard disturbance is more distracting than one that's only visible or only audible.

The partitions' 4-ft. height is based on the average man's eye level when he's seated. They block his view when he's bent over his desk, but let him see into other modules when he straightens up in his chair. Convair thinks partitions should be slightly lower—perhaps 3 feet 10 inches—in an office staffed mainly by women.

Each compartment measures 10½x7 feet and has space for two desks and chairs, a filing cabinet, wastebasket, and visitor's chair. Desks are placed against opposite partitions and offset to give the chairs more push-back space.

Partition panels are made of two ½-in. sheets of a fibrous wallboard glued back to back. They're enclosed in wood framing. Birch was recommended for top and bottom rails, but oak was available and has been satisfactory.

Vertical measurements of partition panels are actually only 3 feet. That's because there's a 1-ft. space between the bottom rail and the floor. This helps air circulate. It also makes the janitor's work easier because telephone and power lines are strung along the bottom rail instead of th floor.

Lighting is no problem. Spaced 12 feet apart in the ceiling are strips of recessed fluorescent fixtures. They're as effective with the modules as with the former open arrangement.

No special effort was made to soundproof the partitions. But Convair says the area seems quieter, probably because direct sound waves are broken up before they get far. Noises tend to become part of the background rather than attention-getters.

PROSPERITY in the USA: Who Has It?

How prosperous *are* the people of the United States?

The previous editorial in this series answered this question for the average American. His prosperity has increased only slightly in recent years.

But the average tells only a part, and in many ways not the most important part of the story. Which individuals and groups have prospered more, which less? (The average, the result of a statistical calculation rather than a creation of flesh and blood, tells nothing about that.)

The purpose of this message is solely to get at the facts on this question of how prosperity is distributed. This is not easy. In spite of the crucial importance of the subject, the available information is limited. Even so it is possible to provide a rough answer to the question, "Who has the prosperity?"

We Have Had a Revolution

The distribution of income in the United States has changed so greatly in the past twenty years that Arthur F. Burns, Research Director of the National Bureau of Economic Research, world renowned for its impartiality and technical competence, calls it "one of the great social revolutions of history." A part of this revolution is portrayed by the following table which shows that individual incomes are both much larger and much more evenly distributed than they were twenty years ago. Clearly, a large new middle-class has been created.

DISTRIBUTION OF REAL INCOME

Dollars of Income*	Per Cent of Families in Each Income Group	
	1929	*1951*
Under 1,000	17%	13%
1,000 – 2,000	24	15
2,000 – 3,000	24	18
3,000 – 4,000	14	18
4,000 – 5,000	6	15
5,000 – 7,500	9	14
7,500 and over	6	7
	100%	100%

*Adjusted for price changes to give the dollar its 1951 purchasing power.

Some light on why this income revolution has taken place can be found by tracing incomes to their source. Since 1929, for instance, employees have clearly made the biggest gains in total income. This can be seen in the next table. People who own their own businesses have done second best. Farmers, who are often thought to be doing handsomely indeed, have been outstripped in the income race by employees and businessmen. People whose incomes depend upon pensions, insurance policies, and other relatively fixed returns such as rent, interest and dividends have lagged far behind.

HOW REAL INCOME HAS CHANGED*

Types of Income	Percentage Change 1929 to 1951
Wages & salaries of employees.	+123%
Income of professional men & unincorporated business	+108
Farm operators' income	+56
Rental income	+1
Dividends	+2
Interest	−35

*In this and the previous table account is taken of changes in the cost of living. But adjustment for the changing tax load was not possible, as it is in the computations which follow.

The Biggest Gains

Employees have made the biggest gains in income, but the term "employees" covers a wide assortment of people—from the presidents of the biggest corporations to factory sweepers. How have different groups of employees prospered? Some indication is provided by results of a survey of salaries in 41 corporations made by Arch Patton of McKinsey and Company and recently summarized in the *Harvard Business Review*. This survey showed that between 1939 and 1950, after adjustment both for higher living costs and for higher taxes, factory and office employees made modest gains in income while management personnel suffered losses ranging from 40% to 60%.

While factory and office workers generally have made greater income gains than others, their gains have varied greatly from industry to industry. During the past five years, for example, steel workers' take-home pay (adjusted for both taxes and price changes) has increased by 22%, that of textile workers 9%, employees of general merchandise stores 4%, and that of laundry workers not at all.

What About Organization?

How have organized workers fared compared to unorganized workers? There is no round-up of facts that makes possible a direct comparison between the two. Such evidence as there is shows it is indeed an open question whether union members have done any better than others. Steel workers, for instance, who are strongly unionized are among the highly paid manufacturing workers. Farm workers are generally not unionized, and they work in one of the most competitive industries in America.

But farm workers have made income gains which far surpass those of steel workers. Real wages of farm workers increased 2½ times more than those in the steel industry between 1939 and 1952. This fact may prove nothing more than that, in a period of inflation and manpower shortage, the less skilled workers whose incomes are ordinarily low make the biggest percentage gain in income. Further support for this conclusion is found in the construction industry where real wages of unskilled labor increased 37% between 1939 and 1952, while those of skilled labor increased only 4%.

Why Most Incomes Are Higher

Prosperity, who has it? We may conclude that workers have been getting much more of it lately than managers or property owners, that unskilled wage and salary earners have made the largest gains, and that income generally is much more evenly distributed.

Where has the money come from to raise low bracket incomes? It has come partly from an increase in the total national income, but partly also from cutting down the share received by people in the highest income brackets. While the top 5% received 33.5% of the income after taxes in 1929, their share of income has now been cut about in half. For every $11 of increase in income to the lower 95% of income receivers, about $7 has come from increased production, and about $4 by taking that amount from the top 5%.

Top bracket incomes have now been cut so deeply that the possibilities of increasing the income of the rest of the people by "soaking the rich" have largely disappeared. Indeed, if all of the income after taxes of everyone earning over $25,000 in 1951 was taken away and redistributed among the remaining Americans, each person would receive only about $65.

The significance of this revolution in income distribution is clear. It is that there is only one way by which the great mass of us Americans can continue to increase our individual prosperity. This is by earning the increase through more and more efficient production. In plotting the economic course of the U.S.A. this fact is of decisive consequence.

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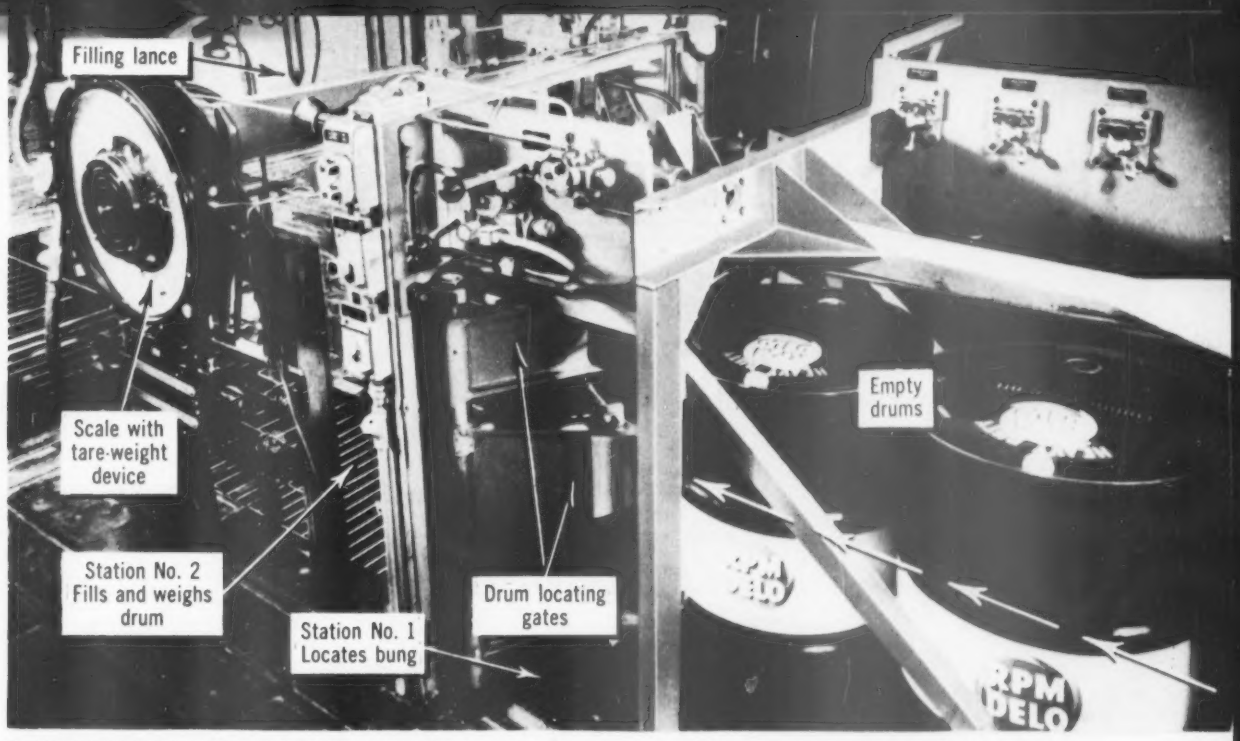

FILLING UNIFORM-SIZE DRUMS AUTOMATICALLY is an old story. But this machine, developed by Standard Oil of California, fills non-uniform drums—at the rate of 1000 per 8-hour shift. Drums vary as much as 4 inches in height, 2 inches in diameter.

Automatic Filler for Non-Uniform Drums

By BRUCE MACDONALD • Senior Engineer, The Rucker Company, Oakland, Calif.

AN AUTOMATIC DRUM FILLER in the Richmond refinery of Standard Oil of California can fill an average of 1000 55-gal. drums per 8-hr. shift, with one operator.

Its advantages:

- Saves $15,000 to $20,000 a year in labor cost.
- Cuts overfill losses.
- Keeps maintenance and downtime costs low.

But the remarkable feature about this filler is its capacity to handle non-uniform drums. Although it could have been designed for a wider range of sizes, the economics of Standard's conditions established these practical limits: 32-in. to 36-in. drum height; 22-in. to 24-in. drum diameter; $\pm\frac{3}{8}$ inch in the distance from chine (rim) to bung of drum.

A powered roller conveyor moves the drums to and from the 2-station filler. At the first station, two pairs of rolls, or "gates," meter empty drums into the machine, one at a time. The gates hold the drum in place and rotate it slowly. An overhead carriage lowers to the top of the drum when it's in position at this station. In this carriage is a finger that rides along the top of the rotating drum. When the drum has rotated until the bung comes into a position on the centerline of the conveyor, the finger drops in. Through controls, this action stops rotation of the drum and opens the gate for movement of the drum to the second station—the filling scale.

When the drum ahead is filled, controls move the overhead carriage forward. It pushes the filled drum off the scale, pulls the next drum on, then raises and retracts to its original position at the first station.

With an empty drum in position at the filling scale, a filling lance lowers into the drum. Submerged filling eliminates foaming. Diverted flow at the nozzle tip minimizes the effect of flow velocity on weighing accuracy. A tare-weighing device automatically corrects for variations in weight of the empty drums. When the drum is nearly filled, flow is reduced to provide accurate weight at the cut-off point.

In the automatic control circuit, engineered by The Rucker Company, is a system of interlocks that prevents oil spillage or damage to the filling machine.

Need help with your problems?

IMPORTANT NEW Free CATALOGS

. . . they're the cream of this month's crop . . . They describe latest methods and equipment. Tell us which ones you want. Use the handy coupon at the bottom of the page. If somebody beat you to it, there's another on page 252.

MECHANICAL EQUIPMENT

1 Compressors
This 44-page catalog provides basic application data and design specifications on a line of reciprocating compressors from 100 to 5000 hp. Describes lubrication, controls, and construction features. Illustrated. Bulletin No. M-70. Cooper-Bessemer Corp.

2 Rotary Pumps
Installation, operation, and maintenance of rotary pumps are covered in this 12-page service manual (No. 100-2). Describes alignment, grouting, packing, other subjects. Charts and drawings. Warren Steam Pump Co., Inc.

3 Evaporative Condensers, Cooling Towers
In this 8-page catalog you get specifications, capacity tables, and dimensions on evaporative condensers and cooling towers. Parts descriptions, design features, and drawings. Bulletin No. 510. Bush Mfg. Co.

4 Metal Cutting Machinery
Here's an 8-page catalog on sheet steel and plate-cutting machinery. It describes equipment with an edge-cutting capacity up to 11/32-in. of mild steel. Gives operating information, specifications, and applications. American Pullmax Co., Inc.

5 Force-Feed Lubricators
Catalog on force-feed lubricators for all types of machinery gives design and construction features, sizes, and prices for the complete line. Included are open and enclosed-type lubricators, 32 pints. Section on accessories included. 16 pages. Catalog No. L-52. Hills-McCanna Co.

6 Pilot Bearing Bushing
Cut-away drawings, applications, dimension sketches, and spec tables in this 4-page folder describe new type of pilot bearing bushing. It's said to provide an absolute seal against coolants, dust, and grits. Lists many users. J. G. Jergens Co.

7 Pumps
Self - priming centrifugal, straight centrifugal, and mudhog diaphragm pumps are covered in this 4-page folder. Features, applications, and illustrations for each type. Also a section on plunger sludge pumps. Bulletin No. G-52. Marlow Pumps.

DUPLICATE COUPON ON PAGE 252

MAIL THIS COUPON FOR FREE CATALOGS *(Good until Mar. 31, 1953)*

FACTORY MANAGEMENT & MAINTENANCE (January 1953)
330 W. 42nd St., New York 36

I'm circling the numbers of the catalogs and bulletins I want:

1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	23	24	25	26
27	28	29	30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46						

Name ..... Title .....

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OTHER CATALOGS

AIR HANDLING . . . . . Page 246
MATERIALS HANDLING 246
ELECTRICAL EQUIPMENT 248
BUILDINGS 250
PROTECTIVE COATINGS 250
MISCELLANEOUS 252
PLANT ENGINEERING 254
PLANT OPERATING 258

Remington Rand Methods News

Which answer is correct for your payroll problem?

Long ago we gave up the idea there could be only one best method for writing payrolls. But show us the specific needs of your particular payroll department and we promise to come up with a profitable answer in terms of speed, accuracy and clerical savings. For instance, here are just a few...

One low-cost answer is the Multi-Matic system which produces a complete set of records from a single manual writing. It's a good method for paying off workers in between paydays; for decentralized payrolls; for the small-to-medium shop. See folder **LL-162.**

Another answer for the economy-minded is our posting calculator payroll method which produces pay records while the payroll calculations are made. For mechanization at minimum cost, see folder **AC-568.**

But, if you want to get out paychecks really fast, look into our remarkable new STUB-CHECK plan – a machine payroll method which eliminates many work steps; also pays for itself in the savings on check forms alone. See **AB-569.**

If you have a piecework or other incentive plan, it may pay you to use punched-card methods which also give you complete labor distribution and cost analyses. Study the detailed procedures in our new case history **SPTM-4218.** Or, if you have a large daywork payroll, see the procedures in **SPTM-4217.**

ABSENTEE CONTROL THAT WORKS! To keep production on schedule, you need people on the job. Let us show you a tested method for control of attendance and punctuality. It's readily accepted by workers because it insures equal treatment for all. You set the yardsticks. Then this simplified record gives you a visual picture of how each employee and department measures up. See our personnel department procedures manual X-521.

BIG AND BOLD MAINTENANCE SCHEDULE. This brand new method helps the maintenance superintendent schedule or re-schedule the work of his crew with both ease and accuracy. It gives a graphic picture of the jobs coming up for each man. And a special written work-order form helps eliminate maintenance errors; simplifies the costing of each job. This is the method featured at Cleveland Maintenance Show. Check below for *Sample Forms.* Also see scheduling manual KD-341.

How to cut drafting costs but not sacrifice quality

"Cheap talent and cheap supplies cannot produce quality drawings," writes an engineer. "But our photographic copying methods have cut drafting costs without sacrifice of quality.

"In fact, our Vacuum Seal Portagraph almost paid for itself by the savings on just one job. We estimate our savings run as high as $15,000 a year by eliminating entire new drawings for each minor change in design."

Let us show you the many ways you can profit from a versatile Portagraph contact printer. (It comes in wide range of sizes.) See our folder **P-305.**

Also, investigate our amazing new Transcopy method which produces a *ready-to-use* photo-exact positive copy in less than a minute! Eliminate paperwork delays with a high-speed mechanized method which handles records to 14" wide, any length. See folder **P-334.**

GET A PRIVATE SHOWING OF NEW SOUND SLIDEFILM ON PRODUCTION CONTROL

It will be 23 minutes well spent for your key executives who get to see this brand new film on efficient coordination of men, machines and materials. Shows you practical methods for speeding a new schedule into actual production, holding down the materials inventory, spotting the bottlenecks before they happen, and adjusting a schedule to new conditions. Check coupon below for showing at your convenience.

Remington Rand

Management Controls Reference Library
Room 1629, 315 Fourth Ave., New York 10

Please circle the literature you desire:

LL-162 AC-568 AB-569
SPTM-4217 SPTM-4218
X-521 P-305 P-334

☐ Maintenance forms and KD-341
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City_____

P-9

JOE'S DEPARTMENT

ELECTRICAL IDEAS EVERY PLANT MAN CAN USE

By JOE ST. ANDRE • Electrical Editor

• WHEN IS AN AREA NOT TOO HAZARDOUS?

When you visit New Orleans, you dine at Antoine's. Also, if you're a FACTORY editor, you gallop through a few plants.

That's me. So I did both while I was at the American Institute of Electrical Engineers meeting in November. I can report that Antoine's is great stuff, but my heart still belongs to Locke-Ober's. As for plants down in New Orleans, the story is the same as everywhere else. They're using more and more electrical controls and equipment. And that has put a premium on good electrical maintenance and construction.

I found plenty of good practice. But I also tuned in on a trio of sour notes that went down in the little black book.

Note 1: One plant I visited prided itself on its up-to-date electrical installations in hazardous locations. The safety engineer was my guide. I noticed that most of the devices had been installed without any seals in the conduit runs. When I asked how come, the safety engineer said, oh, the area wasn't *too* hazardous, so the seals had been left off.

Now, I ask you, when is an area not *too* hazardous? Either it's hazardous, or it isn't. Like eggs. They're either good or bad. There's no such thing as a not-too-bad egg. In this particular installation, they had either spent too much money for explosion-proof devices that weren't needed, or else they had left the area unprotected by half an installation.

Note 2: In the same plant, in another hazardous location, I saw an extension cord with a portable light on it. The cord had a nice explosion-proof plug which was inserted into an approved explosion-proof receptacle. But the light itself was just an old portable light with a wire cage around it. Didn't even have a glass globe around the bulb. (I got out of there fast.)

Note 3: In another plant, I was shown through a new heat-treat department. I noticed they had mounted their power transformers right on top of their electric furnaces.

You guessed it! The transformers were so hot you could smell them. The control wiring was baked to a crisp. The compound was running out of the insulation on the power wiring.

There was plenty of room around the furnace to build a rack to hold the transformers. They could even have been mounted over the control panel, which was located 3 feet away from the furnace.

When I asked the electrical contractor who was installing another furnace nearby (and in the same manner as the furnace I just described) why he mounted the transformers in that way, he looked at me in amazement.

"Why," said he, "any dumb bunny knows it would take more wire and conduit to install them the way you suggest. Look at the savings we are passing on to the customer."

What savings? For the sake of a few dollars' worth of wire and conduit those people were taking half the life out of their power transformers by mounting them in a place where they were exposed to the heat from the top of the furnace.

The lesson to learn here, of course, is that maintenance costs begin most of the time with the installation of the equipment. Take advantage of every possible saving, to be sure, when the equipment is being installed. But don't look at only these savings. You usually install equipment only once, but it will have to work over a number of years. Make sure you get the maximum life out of your equipment. That means seeing to it that it's installed where it won't be exposed to unusual heat.

• SAFETY SIGNS AREN'T MEANT JUST FOR THE OTHER FELLOW

Ever see a DANGER—HIGH VOLTAGE sign hanging from a steam valve? Well, I did. Only last week. Not for the first time, either.

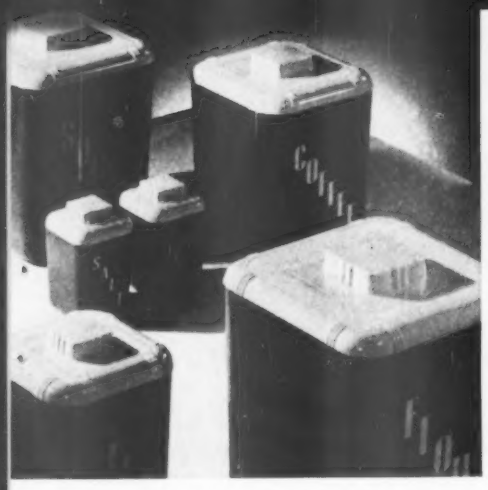
I hope this worries you as much as it does me. I'm sure your plant uses safety signs to warn against electrical hazards. Most plants do. Question is: How effective are they? Do they really stop people from getting hurt?

Warning signs always seem to be meant for the other guy. He's always the one who's going to get hurt—*we* can take all sorts of chances without fear of losing.

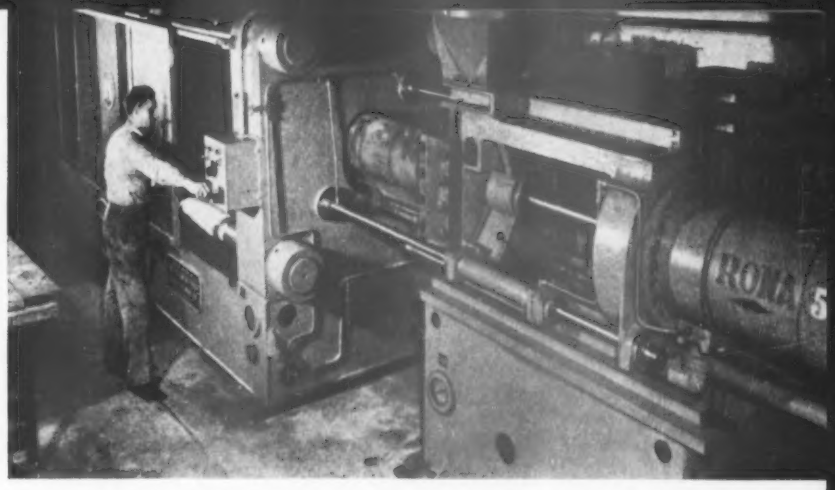
Too bad more of us aren't like the Englishman who was visiting the United States for the first time. While driving along the highway he saw a large sign, DRIVE SLOW—THIS MEANS YOU!

"My word!" he exclaimed. "How did they know I'd be driving along this road?"

Surest way, of course, to make electrical safety signs worse than useless is to use them in the wrong places. I mentioned the DANGER—HIGH



NO MORE PROBLEMS. The production of plastic household items by Rona Plastic Corporation was slowed down by an inadequate hydraulic oil. A switch to Sunvis 999, over a year ago, restored it to normal.



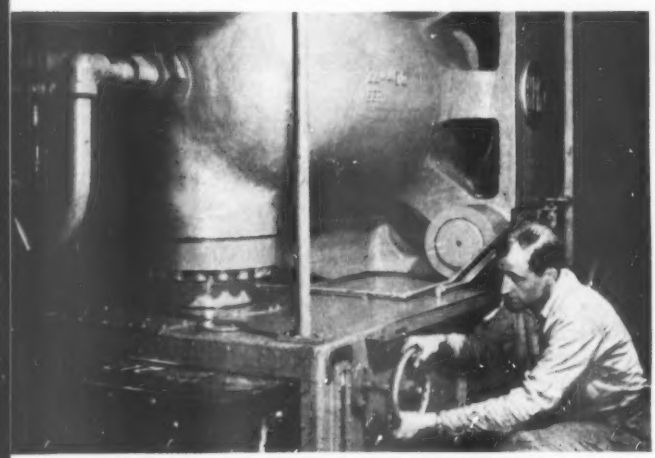
PRESSURE LOSSES ENDED. There are few plastic molding machines as big as this 60 ounce model. It exerts a pressure of 1,000 tons. Because the hydraulic oil formerly used sludged up and thinned out, it could not maintain this pressure. But Sunvis 999 has fully met these severe requirements, as well as those of Rona's nine other hydraulic machines of varying sizes.

PLASTIC MOLDER'S BOTTLENECK ENDED BY SUNVIS HYDRAULIC OIL

More than a year ago Rona Plastic Corporation, New York City, had trouble with its hydraulic molding machines. The machines functioned erratically due to oil sludge sticking the control mechanisms. In addition, the oil thinned out excessively at normal operating temperatures, and resulted in the loss of proper clamping pressures on the dies. To keep the machines going at all, it was necessary to drain, clean, and entirely recharge the systems at frequent intervals.

A Sun representative, called in by Rona, studied the problem and recommended Sunvis 999. He knew it would put an end to pressure losses, because, even at elevated temperatures, it does not decrease in viscosity as much as most other oils. He also knew its exceptional stability would end the sludging problem.

Sunvis 999 proved to be the answer to all Rona's hydraulic oil problems. The original charges, with minimum make-up, are still giving good service. Rona can expect the same performance for a long time to come, because experience shows that under normal operating conditions, Sunvis 900 Series Oils are *good for the life of the equipment.*



NO OIL CHANGES HAVE BEEN NEEDED. Before Sunvis 999 was adopted, the oil in each of the machines had to be changed frequently (the one pictured holds 450 gallons). The original charges of Sunvis 999 have been in use now for more than a year.

Department F-7
Sun Oil Company, Philadelphia 3, Pa.

I am interested in knowing more about Sun Hydraulic Oils. ☐ I would like to consult with a Sun representative. ☐ Send the booklet "Hydraulic Fundamentals and Industrial Hydraulic Oils."

Name_____

Title_____

Company_____

Address_____

City_____ Zone_____ State_____

TECHNICAL ASSISTANCE AVAILABLE. Sun's engineers are at your service for consultation on all hydraulic oil applications. It will pay you to utilize the experience they have gained in solving a wide variety of problems in many different industries.

SUN INDUSTRIAL PRODUCTS

SUN OIL COMPANY, PHILADELPHIA 3, PA. • SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

SUNOCO

VOLTAGE sign on a steam valve. That's not all, of course. I've seen the same signs guarding excavations. Millwrights with a misplaced sense of humor sometimes use them to warn operators not to close disconnect switches when they are working on machines.

Is it any wonder that high-voltage signs often get to mean almost anything except what is written on them?

Be sure, then, that your electrical maintenance department is supplied with the proper safety signs—and that the signs are used *only* where they're supposed to be used. Home-made signs won't do. They are seldom good enough. There are standard approved signs available.

Standardize also on colors and inscriptions. Me, I like signs that tell what voltage you're warning against. High voltage in one plant may mean 2300 volts. In another plant it may mean 13,000 volts.

A little additional information may mean the difference between life and death to someone.

• WHAT A SECOND THERMOSTAT CAN DO FOR YOU

Got thermostats in your plants? How long is it since your maintenance electricians gave them more than a passing glance? Ever stop to think how much dependence you're putting on relatively inexpensive instruments?

Don't wait—as one shop did, not too long ago—till a tank of paraffin blows up to find out.

If you are heating inflammable materials, that little thermostat on the tank may be your only protection against overheating — and perhaps a disastrous fire.

Fortunately you can buy the additional protection you need for the price of another thermostat. Just install it so it goes to work a few degrees above the controlling thermostat. Then, if the latter fails to operate, the second instrument will open the circuit before your material gets hot enough to catch fire.

Same idea works with the pyrometers you use to control furnaces. They are more accurate than thermostats. They cost more. And they're more complicated. They get out of operating condition, too, unless they are maintained properly. A second instrument may appear to be a costly investment. But its cost will be peanuts compared with a fire that may destroy the furnace, the controls, and even the plant itself.

I knew of a magnesium furnace whose controller failed. The temperature climbed to a point where the magnesium castings ignited. The result was a fire that burned five days, completely destroyed the furnace, and cost thousands of dollars for fighting the fire, in addition to loss of production. All because the top heat control contacts had jammed and the instrument kept on calling for more heat. For the saving of a second controller, a $100,000 fire loss was incurred.

You can bet that when the furnace was rebuilt there were *two* controls, and the second was used as a safety device.

• USE TROUGHS FOR WIRING—BUT USE THEM RIGHT

More and more plants are using troughs to contain control wiring. These troughs allow your electrical department to remove and replace wires at will. When the wires are in conduits, it's sometimes next to impossible to pull in an extra wire when you need it.

These wiring troughs should also help cut the cost of construction. But not the way I saw one job being done last week.

The contractor was using troughs all right. But the electricians were carefully lacing up the wires every 12 inches with heavy cord. They were making a beautiful job of it.

Why the lacing? These troughs were horizontal and the wires lay perfectly flat. The cord lacing served no purpose whatsoever. All it did was run up the cost of the job and take up the electrians' time. Also, to remove any wires, a maintenance electrician would have to cut all these lacings.

In other words, they were using troughs so wires could be easily replaced. And then they were lacing the wires to make replacement harder.

Hard to believe, isn't it? But, if you're using these wiring troughs, better make sure the electrical contractor or your own maintenance electricians don't pull the same kind of stunt. It *could* happen in your plant, too.

• CHECK PRESSURE-RELIEF VALVES ON TRANSFORMERS

Your oil-cooled transformers have relief devices on them to take care of excessive pressures that might be built up within the tank because of electrical faults in the windings. Have you checked these devices lately?

Here are a couple of examples of what might happen. One transformer got in trouble and the tank opened up like a sardine can. Reason? The manufacturer had inserted a steel plate between the relief diaphragm and the cap and bolted it down tight to prevent damage during shipment. The contractor forgot to remove the plate.

In the second case, the springs that held the cap tight against the diaphragm had rusted so badly that the cap was "frozen solid."

In both cases, the oil fire that resulted destroyed the whole substation. So find out from the manufacturer how your devices are supposed to work, and then check them before it is too late.

IT'S A BIG ORDER

...and we're grateful

Thanks to you, we've just completed a wonderful, successful year, our sixtieth. Naturally, we're proud of this proof that Hyatt Roller Bearings have earned the confidence of so many leading manufacturers of all kinds of equipment. In the year ahead we will have the advantage of enlarged plants and new, additional facilities to help us fill the continually expanding demand for Hyatt quality bearings. We're grateful for your valued business of the past year and will be looking forward to serving you again in 1953 along with many new Hyatt users. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey, Chicago, Detroit, Pittsburgh, Oakland, California.

HYATT

ROLLER BEARINGS

MAINTENANCE POINTERS

FOR PLANT OPERATING EXECUTIVES

By CARL G. WYDER • Maintenance Editor, FACTORY

▶ Use of reclaimed wood floor block has led to . . .

. . . Saving $20,000 a Year in Floor Relayout Costs

In changing machine layouts in its Marietta, Ga., plant, Lockheed has been ripping up and replacing some 4500 wooden floor blocks a day.

Practice was to discard the old blocks. Bits of concrete, gravel, sand, and pitch that cling to the surfaces after blocks are pulled up prevented reusing them.

In short supply one day, two supervisors named Bell and Poteete thought to salvage some old blocks. They tried scraping the blocks and squirting them with steam, but no go. Then they dumped some blocks into a tank of boiling water and caustic soda. It worked.

So Lockheed rigged up two scrap tanks and steam coils to do this on a permanent basis. Average cost for cleaning 100 blocks runs 23.7 cents. At the rate of 4500 blocks a day, net saving is over $80 per day, and $20,000 per year.

We thought this was impressive. But some points bothered us. So we asked a few questions:

1. How long are blocks dried after soaking? We were worried about cracking and shrinkage. Lockheed says no such thing occurs. The blocks are stacked in the open air for several days, or until used. It seems that enough creosote remains in the blocks after cleaning so redipping is not necessary. But if necessary, they added, the cost of redipping would be small.

2. How are blocks removed from the floor? Workmen use picks or mattocks. Breakage runs less than 15%. Blocks go into bath as is.

3. Why add caustic soda to boiling water? We asked this because coal tar pitch is resistant to acids and alkalis. But it melts at 140F. Lockheed says caustic soda acts as a detergent in cleaning off the dirt and grit. Also, it prevents pitch from resticking in the hot bath.

About one gallon of caustic soda is mixed with each 200 gallons of water. Another 2 or 3 pounds of soda is added to each succeeding batch. Each tank is 4 feet square and 3 feet deep. Drain cocks in the bottom carry off the hot pitch, dirt, and water at the end of each day's cleaning.

Normal cleaning time is about 30 minutes. Blocks are taken directly from the bath and stacked to dry. They maintain their creosote color and resemble new blocks.

▶ How to Improve Your Exhaust Systems

One good way is to call in a consultant. Another way is to train your own expert. Then you'll have an expert permanently on your staff.

How to train him? Michigan State College, Lansing, Mich., is holding its second annual industrial ventilation conference next February 16-19. At classroom sessions — restricted to small groups—experienced engineers will work out elementary and advanced problems. There will also be talks and demonstrations on such subjects as duct design and selection of air tempering units.

Write K. E. Robinson, Consulting Ventilation Supervisor, Division of Industrial Health, at the college for full details.

* * *

► **When operators can't avoid damaging thermal insulation on their machines,** cover the vulnerable spots with metal skidproof plates. A Pennsylvania chemical plant protected mineral wool blankets at the center and hatch opening of a reaction kettle this way.

Turn to page 254 for good ways to solve special plant engineering problems

Alemite "Friction Fighters"

save $2000 a year for steel company!

...add 30 minutes' operating time daily, end bearing failures and lubricating hazards

A mammoth traveling crane carrying tons of steel making constant stops and quick returns. Here—friction's wear and tear posed a costly problem in bearing replacement. Shutdowns were frequent. Delays cut into operating time.

To end this problem once and for all—plant engineers called in an Alemite "Friction-Fighting" specialist. Specific requirements were discussed in detail. Past difficulties were reviewed. Recommendations were made, and an Alemite Mechanized Lubrication System was installed.

This action brought immediate four-way savings: Eliminating lubrication down-time added 30 minutes daily productive use of the crane—time worth $9 a day, $2000 per year. 60% less grease was used. Expensive bearing replacements were eliminated. Also, the 60 foot climb to lubricate out-of-the-way bearings in dangerous locations was eliminated.

Conquering friction is Alemite's business—cutting costs, decreasing down-time, increasing profits. An Alemite Lubrication Engineer can show you ways of making savings. Contact your local Alemite Distributor now.

Alemite—the great name in lubrication serves the great names in industry

Wherever metal touches metal, wherever you find machinery in motion, you're most likely to find Alemite Lubrication and Lubrication Systems on the job. Here are but a few of the industrial leaders who use Alemite.

Eastman Kodak Company • Procter & Gamble
Boeing Airplane Company • Swift & Company
International Harvester Company

A PRODUCT OF SW STEWART WARNER

ALEMITE

35 Years of Lubrication Progress

Alemite "Oil-Mist" Lubrication—another amazing "Friction-Fighting" Development

This most efficient, continuous, fully automatic system in all the field of machinery lubrication atomizes oil into mist—distributes it through tubing to bearings. Visit Alemite Booths 201-205, Plant Maintenance Show, January 19-22, Cleveland, Ohio.

Please send me **FREE** *New Booklet*

☐ "11 Ways to Cut Production Costs."

☐ Include Facts on "Oil-Mist"—the amazing new system that atomizes oil, circulates it to bearings under pressure.

ALEMITE, Dept. G-13
1850 Diversey Parkway, Chicago 14, Ill.

Name .....

Company .....

City ..... State .....

management data sheet 70

Data prepared by: **PAUL BROADSTONE** • Production Engineering Supervisor
R. G. LeTourneau, Inc., Longview, Texas

Arc Welding Time Standards

IN THE TABLES BELOW and on page 156 are standard times for the welding, weld cleaning, and preparation elements of manual arc welding. The time standards shown for welding and cleaning welds apply to the use of an all-purpose (E 6012) electrode on flat or fillet welds. The standard times for overhead welds are 15% higher. Other tables of values have been developed for other electrodes.

Depending on the conditions under which the job is performed, LeTourneau allows 20% to 35% for PF&D (personal, fatigue, and delay time) in addition to the standard times indicated.

These values are the result of 15 years' development and use in R. G. LeTourneau, Inc.

PREPARATORY TO WELDING

Change rod	.15 Std. min. /Occurrences	(To get "standard minutes per inch of weld," divide 0.15 by inches of weld per rod.)
Change amperage	.44 Std. min. / "	
Clamp ground to work	.55 Std. min. / "	
Prepare to weld	.12 Std. min. / "	

SLAG COMPLETED WELD WITH SLAGGING TOOL • • • .039 Standard minutes per inch of weld.

SLAG CRATER • • • Standard minutes per inch of weld.

ROD SIZE In inches	Weld size in inches 1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	7/8	1
1/8	.014	—	—	—	—	—	—	—	—	—
5/32	.008	.014	.022	—	—	—	—	—	—	—
3/16	.006	.009	.014	.021	.029	—	—	—	—	—
7/32	—	.006	.009	.012	.016	.028	—	—	—	—
1/4	—	.004	.007	.009	.012	.021	.031	.040	.055	.080
9/32	—	—	.005	.007	.009	.015	.022	.033	.043	.060
5/16	—	—	.003	.006	.008	.012	.019	.027	.034	.044

WELDING • • • Standard minutes per inch of weld; amps measured at holder.

ELECTRODE SIZE 1/8"x14"

Weld size 1/8"—Inches/rod 8.8

75 Amps	.167 Std. min.
100	.137
125	.113
150	.093

ELECTRODE SIZE 5/32"x14"

Weld size 1/8"—Inches/rod 14.0

100 Amps	.125 Std. min.
125	.108
150	.092
175	.081
200	.070

Weld size 3/16"—Inches/rod 8.8

100 Amps	.200 Std. min.
125	.172
150	.148
175	.129
200	.112

Weld size 1/4"—Inches/rod 5.5

100 Amps	.320 Std. min.
125	.275
150	.236
175	.206
200	.177

ELECTRODE SIZE 3/16"x14"

Weld size 1/8"—Inches/rod 18.8

125 Amps	.102 Std. min.
150	.088
175	.079
200	.070
225	.063
250	.057
275	.052

Weld size 3/16"—Inches/rod 12.7

125 Amps	.150 Std. min.
150	.132
175	.117
200	.103
225	.093
250	.085
275	.078

Weld size 1/4"—Inches/rod 8.3

125 Amps	.229 Std. min.
150	.200
175	.178
200	.158
225	.142
250	.131
275	.120

Weld size 5/16"—Inches/rod 5.3

125 Amps	.358 Std. min.
150	.315
175	.279
200	.248
225	.224
250	.204
275	.187

Weld size 3/8"—Inches/rod 3.8

125 Amps	.500 Std. min.
150	.437
175	.392
200	.347
225	.311
250	.285
275	.261

ELECTRODE SIZE 7/32"x18"

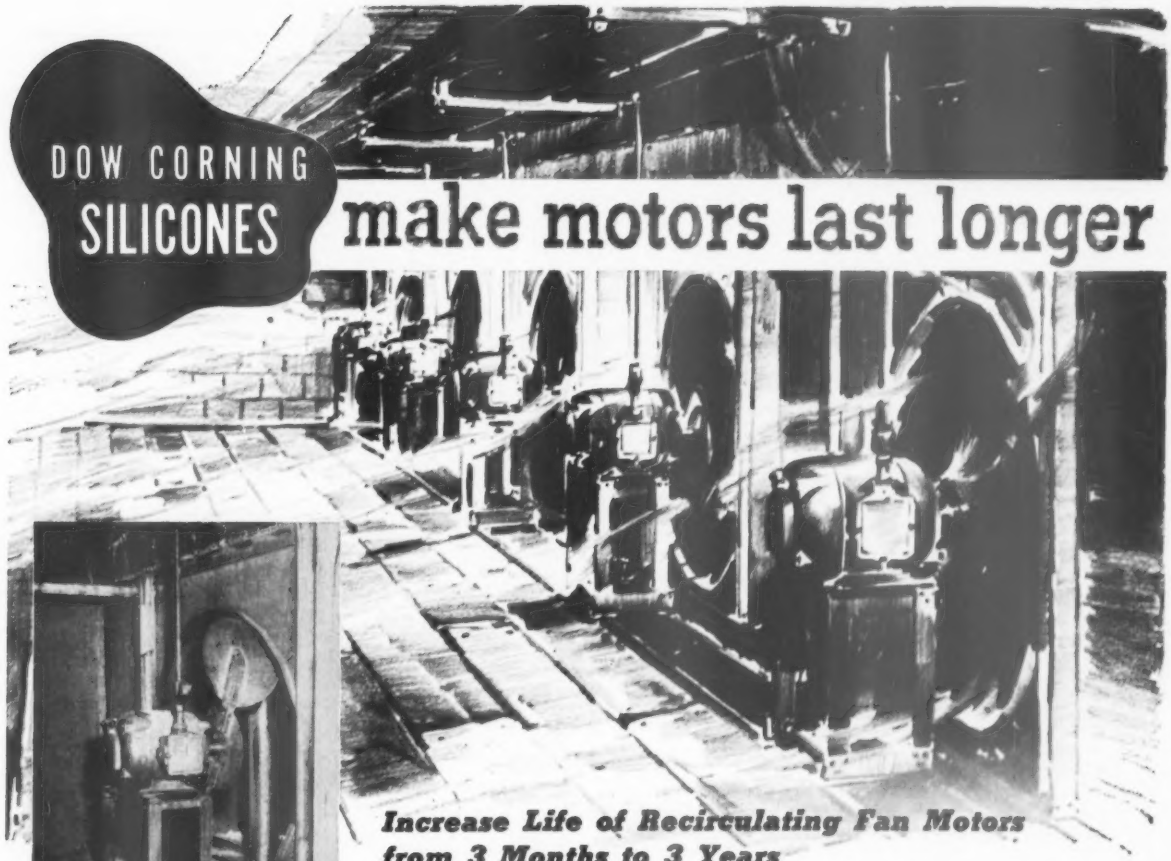
Weld size 3/16"—Inches/rod 19.5

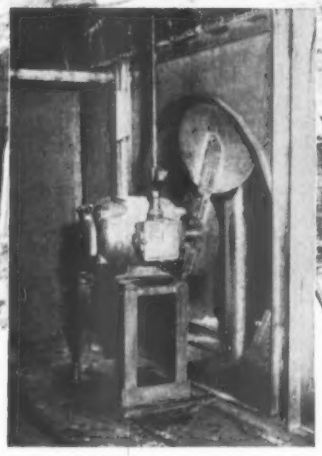
150 Amps	.142 Std. min.
175	.128
200	.115
225	.102
250	.094
275	.085

Turn the page

DOW CORNING SILICONES

make motors last longer





Increase Life of Recirculating Fan Motors from 3 Months to 3 Years

The Wood Development Corporation of Sidnaw, Michigan had a problem. None of the 21 Class A insulated 1½ hp fan motors recirculating air in their drying kiln ever lasted more than three months. Fumes from kiln-dried lumber are hot; moisture content is almost 50%; and they're acid enough to eat the nameplates right off the motors.

Over three years ago one of those motors was rewound with Silicone (Class H) insulation. As the others failed they were also rewound with Class H insulation. None of these motors has burned out. The first of them is still in service after more than 12 times the average life of Class A motors under the same operating conditions.

That's the kind of performance that has persuaded more and more production and maintenance men to specify Silicone (Class H) Insulation for hard working motors. Motors rewound with silicone insulation can deliver half again their nameplate rating; outlast ordinary motors more than 10 to 1. They require no extra fittings, mounts, or wiring for re-installation, and they cost very little more than motors wound with the next best class of insulating materials.

CUT MOTOR BEARING MAINTENANCE with DOW CORNING 44 SILICONE GREASE

Proved by performance in the permanently sealed bearings of thousands of motors prelubricated for a good five years by a leading motor manufacturer, Dow Corning 44 Silicone Grease saves downtime; pays for itself in reduced relubrication costs.

mail this coupon Today

DOW CORNING CORP., Dept. L-1
Midland, Michigan
Please send me:
- ☐ Catalog of Class H Insulating Materials.
- ☐ List of Class H motor repair shops.
- ☐ Data on Silicone Grease for motor bearings.
- ☐ 32-page booklet entitled "What's A Silicone?"

Name_____

Company_____

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DOW CORNING CORPORATION
MIDLAND MICHIGAN

Atlanta • Chicago • Cleveland • Dallas • New York • Los Angeles • Washington, D.C
In Canada: Fiberglas Canada Ltd., Toronto • In England: Midland Silicones Ltd., London

Begins on page 154

WELDING (continued) · · · Standard minutes per inch of rod; amps measured at holder.

Weld size ¼"—Inches/rod 13.8

150 Amps	.202 Std. min.
175	.181
200	.162
225	.145
250	.133
275	.121

Weld size 5/16"—Inches/rod 10.0

150 Amps	.280 Std. min.
175	.250
200	.223
225	.200
250	.183
275	.167

Weld size ⅜"—Inches/rod 7.5

150 Amps	.373 Std. min.
175	.333
200	.297
225	.267
250	.244
275	.222

Weld size ½"—Inches/rod 4.3

150 Amps	.651 Std. min.
175	.581
200	.521
225	.465
250	.426
275	.387

ELECTRODE SIZE ¼"x18"

Weld size 3/16"—Inches/rod 29.0

225 Amps	.083 Std. min.
250	.075
275	.069
300	.063
325	.059
350	.055

Weld size ¼"—Inches/rod 17.8

225 Amps	.135 Std. min.
250	.122
275	.112
300	.103
325	.097
350	.089

Weld size 5/16"—Inches/rod 12.7

225 Amps	.189 Std. min.
250	.172
275	.157
300	.146
325	.135
350	.125

Weld size ⅜"—Inches/rod 9.5

225 Amps	.252 Std. min.
250	.229
275	.210
300	.194
325	.181
350	.167

Weld size ½"—Inches/rod 5.6

225 Amps	.428 Std. min.
250	.389
275	.357
300	.329
325	.264
350	.282

Weld size ⅝"—Inches/rod 4.0

225 Amps	.600 Std. min.
250	.545
275	.500
300	.461
325	.428
350	.396

Weld size ¾"—Inches/rod 3.0

225 Amps	.800 Std. min.
250	.726
275	.666
300	.616
325	.571
350	.527

Weld size ⅞"—Inches/rod 2.2

225 Amps	1.091 Std. min.
250	.991
275	.908
300	.840
325	.779
350	.719

Weld size 1"—Inches/rod 1.5

225 Amps	1.599 Std. min.
250	1.449
275	1.333
300	1.233
325	1.141
350	1.050

ELECTRODE SIZE 9/32"x18"

Weld size ¼"—Inches/rod 25.2

275 Amps	.095 Std. min.
300	.087
325	.080
350	.074
375	.069
400	.066

Weld size 5/16"—Inches/rod 18.0

275 Amps	.133 Std. min.
300	.122
325	.112
350	.103
375	.097
400	.092

Weld size ⅜"—Inches/rod 13.3

275 Amps	.181 Std. min.
300	.164
325	.152
350	.141
375	.131
400	.124

Weld size ½"—Inches/rod 8.0

275 Amps	.300 Std. min.
300	.272
325	.252
350	.233
375	.217
400	.206

Weld size ⅝"—Inches/rod 5.4

275 Amps	.444 Std. min.
300	.404
325	.373
350	.346
375	.322
400	.306

Weld size ¾"—Inches/rod 3.7

275 Amps	.650 Std. min.
300	.590
325	.541
350	.505
375	.469
400	.446

Weld size ⅞"—Inches/rod 2.8

275 Amps	.858 Std. min.
300	.779
325	.716
350	.666
375	.621
400	.589

Weld size 1"—Inches/rod 2.0

275 Amps	1.200 Std. min.
300	1.091
325	1.008
350	.933
375	.866
400	.825

ELECTRODE SIZE 5/16"x18"

Weld size ¼"—Inches/rod 32.8

325 Amps	.071 Std. min.
350	.068
375	.064
400	.061
425	.057
450	.056
475	.053

Weld size 5/16"—Inches/rod 21.4

325 Amps	.113 Std. min.
350	.105
375	.098
400	.093
425	.088
450	.086
475	.081

Weld size ⅜"—Inches/rod 15.9

325 Amps	.152 Std. min.
350	.142
375	.132
400	.125
425	.118
450	.115
475	.109

Weld size ½"—Inches/rod 10.0

325 Amps	.242 Std. min.
350	.225
375	.210
400	.198
425	.188
450	.183
475	.173

Weld size ⅝"—Inches/rod 6.5

325 Amps	.372 Std. min.
350	.346
375	.323
400	.306
425	.289
450	.282
475	.267

Weld size ¾"—Inches/rod 4.5

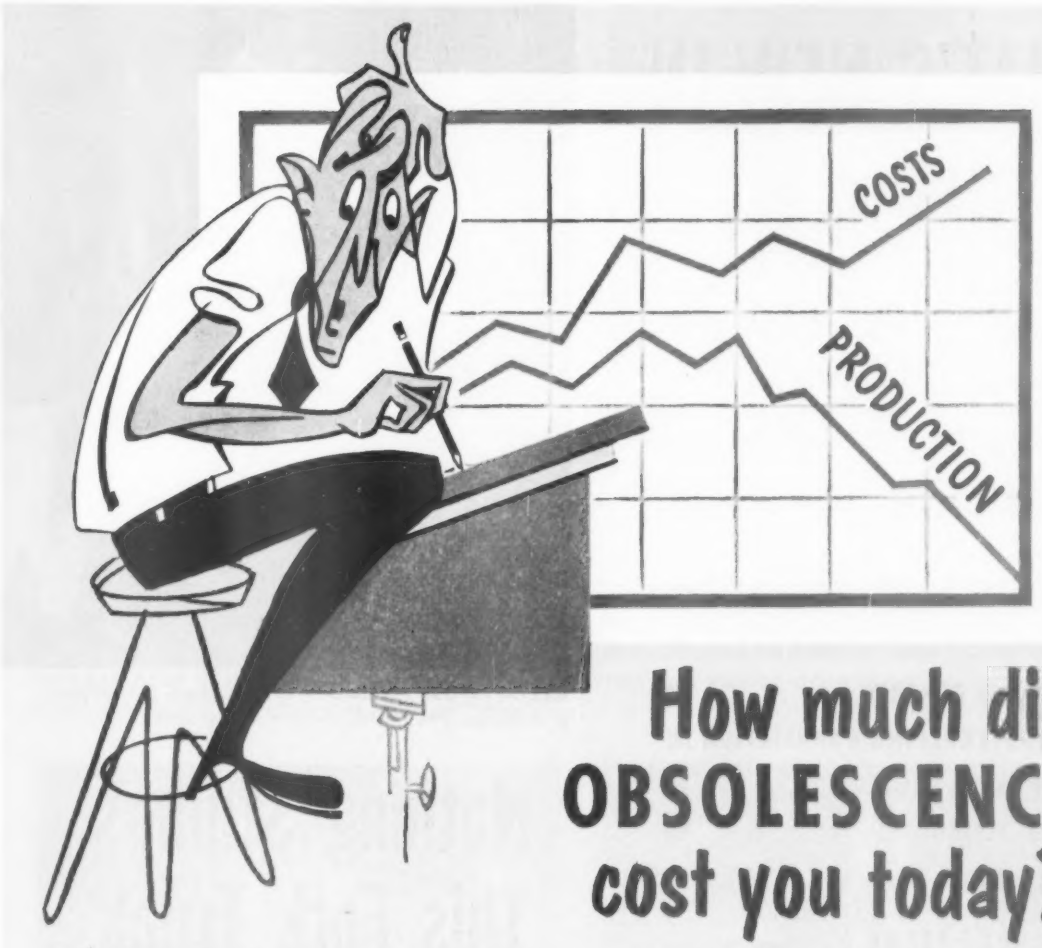
325 Amps	.536 Std. min.
350	.500
375	.466
400	.441
425	.417
450	.407
475	.386

Weld size ⅞"—Inches/rod 3.5

325 Amps	.691 Std. min.
350	.641
375	.600
400	.566
425	.538
450	.525
475	.496

Weld size 1"—Inches/rod 2.7

325 Amps	.891 Std. min.
350	.833
375	.775
400	.735
425	.697
450	.680
475	.641



How much did OBSOLESCENCE cost you today?

THE FASTEST WAY for a machine to become obsolete is for someone to develop a new machine to do the same job faster, better, and more economically.

Look at it this way. Say you operate a machine tool that turns out 50 work units an hour. If your competitor installed a 100-unit-per-hour machine at a price comparable to yours, his competitive unit cost would give you trouble. In effect, the minute he went into production, your machine became obsolete.

When it comes to constant efforts to improve our product, CLARK pleads guilty. The quality fork truck that you bought some years ago may be secretly (to you) suffering from obsolescence, even though it is still doing the job you bought it for. It's not hard to recognize obsolescence when it shows up in high maintenance costs and repair bills. But that's only going skin-deep. The important thing to know is this: how much faster, how much better and at how great a savings can you do the same job with today's CLARK trucks.

New CLARK Trucks to replace your obsolete equipment will step up production and cut service charges so drastically that they'll soon pay for themselves.

How much did obsolescent handling equipment cost you today? You owe it to yourself to know—and then to capitalize on that knowledge by calling in your nearby CLARK Dealer. He'll help you set up a *profitable* modernization program.

1903 1953 CLARK EQUIPMENT

CLARK ELECTRIC AND GAS POWERED FORK TRUCKS

AND POWERED HAND TRUCKS • INDUSTRIAL TOWING TRACTORS

INDUSTRIAL TRUCK DIVISION • CLARK EQUIPMENT COMPANY • BATTLE CREEK 12, MICHIGAN

Please send: ☐ Material Handling News ☐ Movie Digest
☐ Have Representative Call.

Name _____

Firm Name _____

Street _____

City _____ Zone _____ State _____

AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

WHAT'S NEW IN EQUIPMENT

. . . BRIEFED HERE FOR THE CONVENIENCE OF PLANT OPERATING MEN IS INDUSTRIAL PLANT EQUIPMENT NOW ON THE MARKET . . .

MATERIALS HANDLING . . . STARTS HERE
AUXILIARY EQUIPMENT 168
ELECTRICAL EQUIPMENT 172
MAINTENANCE TOOLS & SUPPLIES . . 180
MEASURING & CONTROL 188
PLANT HOUSEKEEPING & SANITATION 192
SAFETY & PLANT PROTECTION 195
VALVES & PIPING 196
MISCELLANEOUS 200

IN THE NEXT ISSUE ..... **Some notes on important late items. More about them next month.**

Precision weighing attachment fits any standard fork truck without alteration. Makes it possible for you to combine the operations of weighing and load-moving in a single piece of equipment.

Wheelersmith, Ltd., c/o R. A. Foort, Cunard Line, 25 Broadway, New York.

New sprinkler head throws all water spray laterally and downward instead of directing 60% of discharge against ceiling as do conventional sprinkler heads. Tests show superior performance in fires of all hazard classes.

"Automatic" Sprinkler Corp. of America, Youngstown 1.

Automatic bag-filling scale holds, fills, checkweighs, and releases up to 6 bags a minute. Holds weight of materials with high flooding characteristics within 2 ounces of any desired weight from 25 to 200 pounds.

Thayer Scale & Engineering Corp., East Water St., Rockland, Mass.

Cleaning solvent for electric motors and generators does job two ways. You can completely submerge motor in solvent and run it 3 to 5 minutes, or you can spray solvent into intake side of motor while it's running.

Shaler Co., Waupun, Wis.

MULTI-PURPOSE FLEXIBILITY of the Octopus is highlighted as it clamps, lifts, rotates, and tilts a steel drum.

Nothing Stumps This Fork Truck

Looking for versatility? Just name the job, and the chances are that Baker-Raulang's Octopus can handle it—with a minimum of time out for converting truck to handle different types of loads.

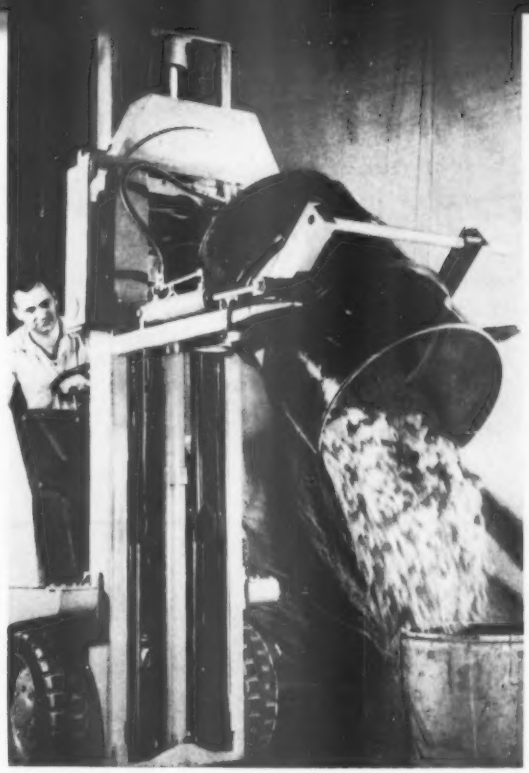
Here's how the Octopus works: a 4-purpose lift carriage assembly, in place of the regular fork lift carriage, converts any standard Baker battery-powered 2000- to 4000-lb. fork truck into a multi-purpose handling machine. It functions as a standard fork truck, as a clamp truck, or as a fork-spacer. And a simple linkage control at the driver's seat converts the Octopus into a side-shifter that enables you to line up loads in tight spots.

Even more flexibility is added by four other attachments to the special carriage: a semi-permanent revolving head, hydraulic up-ender, and easily-attachable drum clamps and clamp-spikes.

You can control this whole assortment of attachments from the driver's seat. Just a short pause is needed to put on clamp pads or clamp-spikes by sliding them onto fork blades and securing them with a simple locking-pin.

Baker Industrial Truck Div., Baker-Raulang Co., Cleveland 2.

Turn the page

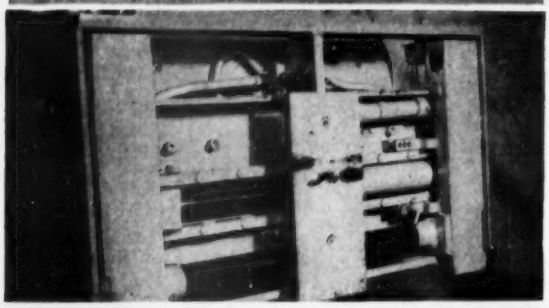
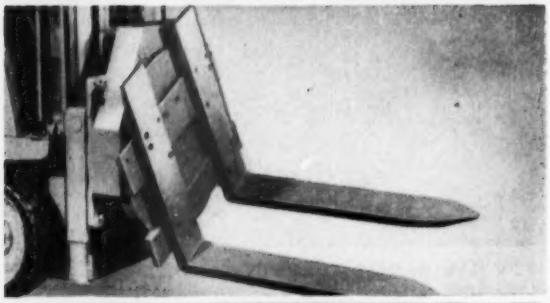
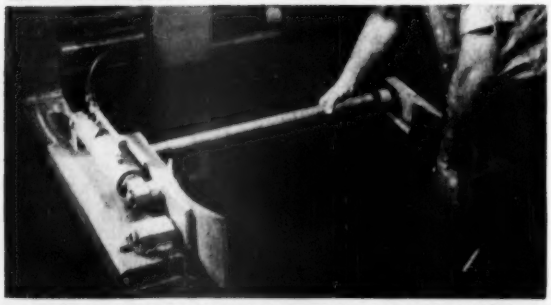
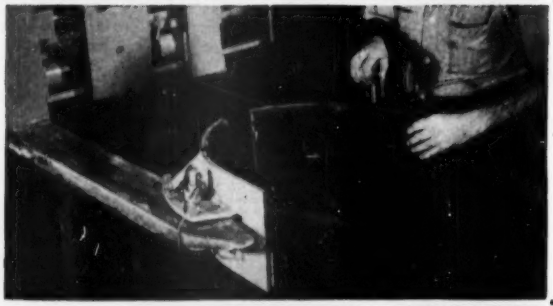
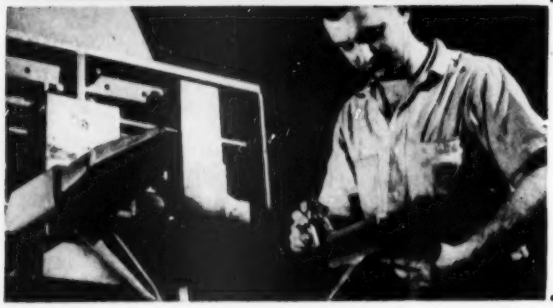


YOU CAN DUMP DRUMLOADS of bulk materials with the hydraulic up-ender that tilts containers up to 135 degrees.

YOU CAN HANDLE CYLINDRICAL LOADS such as drums, large pipe, tanks, coils, and rolls with rubber-padded clamps.

YOU CAN HAUL BALES of materials like cotton, crude rubber, paper, and metal scrap with clamp-spikes that slip on forks.

YOU CAN TAKE DIFFERENT-SIZED PALLETS in stride with automatic fork-spacing that is controlled from driver's seat.

ATTACHMENT	WHAT WILL IT DO
	**4-PURPOSE CARRIAGE . . .** • Handles regular pallet loads with ease. • Works as a clamp to handle unpalletized loads such as bales of cotton, scrap, or crude rubber. • Adjusts fork spacing from driver's seat to accommodate different pallet sizes. • Side-shifts to avoid "jockeying" in tight areas.
	**REVOLVING HEAD . . .** • Revolves loads 360 degrees in either direction from control at driver's seat. • Speeds dumping of tote boxes and other containers. • Allows horizontal or vertical stacking of paper rolls, drums, and similar loads.
	**HYDRAULIC UP-ENDER . . .** • Picks up, hauls, and up-ends cylindrical loads like drums, barrels, large pipe, boilers, and paper rolls. • Rotates forward 135 degrees from vertical position. • Empties drums of scrap, parts, or bulk material. • Stacks loads vertically or horizontally.
	**CLAMP PADS . . .** • Slip on forks of 4-purpose carriage to pick up, haul, and stack drums in vertical position. • Are fitted with curved, rubber-faced grab plates.
	**CLAMP-SPIKES . . .** • Slip on forks of 4-purpose carriage and bite into baled crude rubber, paper or metal scrap, or textiles to pick up and haul them. • Are withdrawn by hydraulic spacing action to release load.

INSTALLATION	SPECIFICATIONS
• The 4-purpose carriage is more a permanent carriage than an attachment. You can install it in the field on a Baker fork truck now being used with regular carriage. And you can do the whole job in a day. • Can be installed on Baker fork trucks of from 2000- to 4000-lb. capacity.	• The complete lift carriage assembly is equipped with a hydraulic cylinder and roller chain device for operating the spacing, clamping, and side-shifting actions. • Available in 36-, 42-, and 48-in. outside fork spread with standard 36-in. long forks, 4 or 5 inches wide. Other fork lengths available. • Special carriage does not affect load capacity of the fork truck.
• Available as either a permanent or semi-permanent attachment, depending on your needs. • When semi-permanent, you can install or demount it in 30 minutes or less, without special tools. • Can be installed on trucks of 2000-lb. capacity or more.	• Consists of a stationary bed plate attached to the fork carriage with a face plate revolving 360 degrees in either direction on tapered roller bearings. Forks or other handling devices are attached to face plate. • Hydraulic power for rotation is supplied by truck's lift-tilt motor and pump. Rotation speed is controlled through metering valve. • Subtracts 6 inches from load length. • Weighs 250 pounds.
• Can be installed in about 3 minutes by one or two men without special tools. • You just slide it on truck forks, lock it in place with pins, and connect to hydraulic lines of the 4-purpose carriage with "snap-on" Hansen couplings. • Must be used with 4-purpose carriage because it uses carriage's hydraulic clamping action.	• Available in 36-, 42-, and 48-in. outside carriage widths. Maximum load diameter is 19½ inches with 36-in. carriage width, 25½ inches with 42-in. width, and 31½ inches with 48-in. width. • Clamp pressure and friction qualities of clamp pads limit load capacity to 1000 pounds and 48-in. length. • Clamping pressure varies from 600 to 1400 pounds at 24-in. outreach. • Weighs 120 pounds.
• Can be installed easily by one man in less than a minute. • You just slip them onto truck forks and then lock them in place with pins.	• Consist of 2 shoes fitted with curved, rubber-faced grab plates. • Handle cylindrical loads up to 24¾-in. diameter on 36-in. carriage, 30¾-in. diameter on 42-in. carriage, and 36¾-in. diameter on 48-in. carriage. • Clamp pressure and friction qualities of pads limit load to 1000 pounds and 48-in. length. • Weigh 90 pounds.
• Same as clamps—one man does the job in less than a minute. • You just slip them onto truck forks and lock in place with pins.	• Consist of two slip-on sleeves to which are welded triangular spikes. • Length and slant of spike depend on your application needs. • Do not affect load capacity of truck.

How Portable AerVoiDs fit into Industrial Feeding

AerVoiD *Vacuum Insulated*
HOT FOOD, SOUP AND COFFEE CARRIERS

PORTABILITY DOES IT!

By providing a means by which hot foods and liquids can be transported and serviced at a distance from the kitchens where they are produced, AerVoiD Vacuum Insulated Hot Food Carriers do a job in industrial feeding that cannot be accomplished with any other equipment.

AerVoiDs are the only complete line of portable food servicing equipment on the market.

In storing, transporting, distributing hot foods AerVoiDs do a 3-ply job in industrial feeding, fitting into any industrial feeding setup.

Ways in which AerVoiDs fit into industrial feeding are enumerated at right.

Food consultants to help you with any industrial feeding problem without cost or obligation.

Write for folder FM-10,
"The Job AerVoiDs Do In Industrial Feeding"

VACUUM CAN COMPANY
19 SOUTH HOYNE AVENUE CHICAGO 12, ILLINOIS

Industrial Plants Use AerVoiDs to

- transport hot foods to workers that cannot get to cafeterias without too much loss of production time
- provide midshift coffee break to workers near their work (Plant and Office)
- provide hot foods for night workers after cafeterias are closed
- provide hot foods for increased personnel
- transport hot foods from kitchens to canteens
- provide hot foods for overtime workers
- provide hot foods for outdoor workers
- centralize food production.

AerVoiD Mobile Canteen. Hot coffee, hot soup and light refreshments for workers near their work.

HERE'S AN EXAMPLE

Hot foods, hot coffee on the way to Cannery workers in the field to save time lost bringing workers in for meals.

Begins on page 158

MATERIALS HANDLING

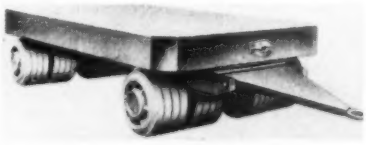
Loading Dock Shelter

You can protect your men and materials against bad weather, increase handling efficiency and keep your dockboards dry with this rugged canvas dock shelter.

It extends on a collapsible steel framework to truck or freight car loading doors of any size and folds flush against the building when not in use.

Atlas Products Co., 1300 W. Washington Blvd., Chicago 7.

■



For Heavy Loads

You can move up to 60 tons of materials like heavy castings, forgings, finished components, dies, and steel on this trailer. It has a body framework of I-beams and channels, deck surface of smooth steel.

You can pull unit either singly or in train with an industrial tractor. Basic size is 7½ feet wide and 12 feet long, and you can get it custom built.

Phillips Mine & Mill Supply Co., 2324 Jane St., Pittsburgh 3.

Turn the page

HANDLING HELPS

by A.L.L.

Here's a Winning Team

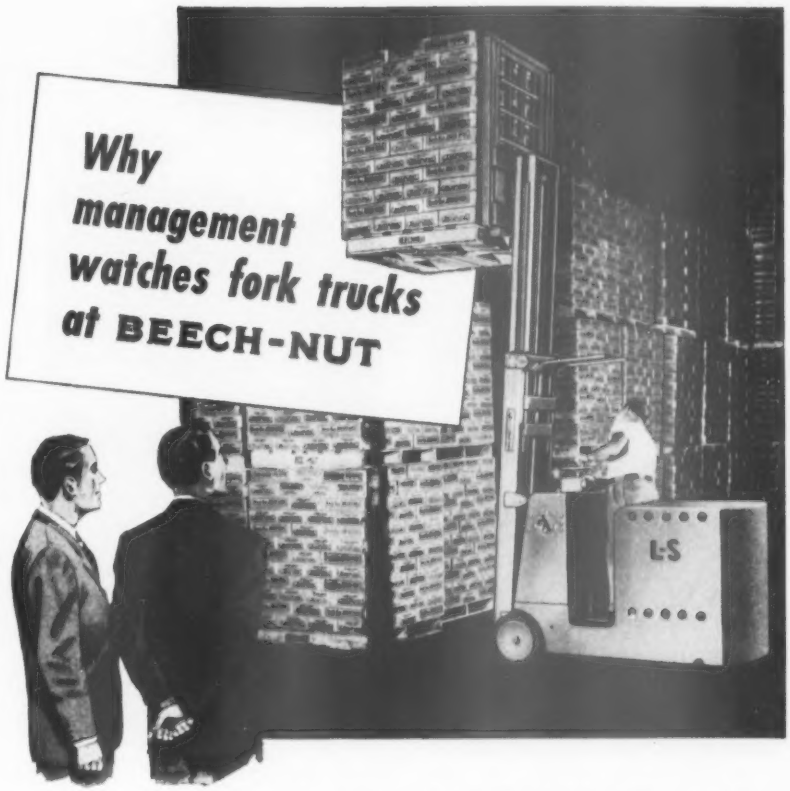
We've noted a trend: more and more users are cutting costs by teaming up their hand and power equipment. One case in point is this paint manufac-

turer's use of the Lewis-Shepard Jacklift Hydraulic Pallet Truck with their L-S Electric SpaceMaster. When you have short hauls or limited space, there's nothing so efficient and economical as a hand lift truck . . . especially when you make it supplement the heavier work of a power truck. Lewis-Shepard has a complete line. Check the potent possibilities. We'd be pleased to furnish you with more information.

Increase your Storage Space 40-50%

Here's a fork truck that will right angle stack in less than 6 foot aisles, even with 48" long loads. The usual 10 to 12 ft. aisles can be reduced at least 40%, the extra space converted to

storage. It certainly beats building a new building, and the cost of this truck is half that of the standard electric fork truck. We're talking about the L-S Model "M" with a 3000 lb. capacity. If you want more information, it's yours for the asking. L-S has a variety of models, riding and walkie types, highlift or lowlift — designed for narrow aisle operation. *Write Lewis-Shepard Products, Inc., 16 Walnut St., Watertown 72, Mass.*



Ability to move and stack goods quickly and efficiently has a direct bearing on the profit picture at Beech-Nut Packing Company. That's why officials at Beech-Nut are particularly selective when buying materials handling equipment for their large-volume, fast-turnover business.

Mr. L. M. Spraker, Beech-Nut Materials Handling Engineer says, "The features that sold us on the Lewis-Shepard SpaceMaster Electric Fork Trucks are *compactness* and *sturdiness of design*. These two advantages give us the required maneuverability. And another thing . . . in any operation of industrial trucks, the amount of downtime can be a serious bottleneck in the flow of materials. Our Lewis-Shepard Trucks have an excellent record of dependability. My estimate of downtime is between 1% and 2% of our total operating time."

Lewis-Shepard SpaceMaster Trucks are reducing materials handling costs — boosting profits — in every industry. Why not prove for yourself their greater dependability and economy? Write for "Proof Booklet". Save time — use coupon below.

HERE'S MORE PROOF OF LEWIS-SHEPARD ELECTRIC FORK TRUCK DEPENDABILITY

Listed are some current L-S reorders from blue-chip companies in various industries:

Paper Mfg.	had 26	reordered 4
Gen'l Warehouse	had 8	reordered 30
Piping Products	had 3	reordered 2
Adhesive Mfg.	had 14	reordered 1
Food Chain	had 44	reordered 7
Elec. Equipment	had 17	reordered 2
Cold Storage	had 8	reordered 1
Chemical Mfg.	had 8	reordered 3

LEWIS-SHEPARD®

Nationwide Service — See "Trucks, Industrial" in your Yellow Phone Book

The "MASTER" Line

LEWIS-SHEPARD PRODUCTS, INC.

16 Walnut St., Watertown 72, Mass.

Please send me Catalogs and "Proof Booklets" illustrating SpaceMaster Trucks at work.

Name .....

Company .....

Street .....

City ..... State .....

ELIMINATE GLUING TIME -cut costs!

use SEGMENTED PRC felt tapes *with* ADHESIVE BACKS!

PRC segmented tapes are defeating problems every day on assembly jobs requiring repeated use of equal-sized felt pieces. Each segment is as easy to tear off as a postage stamp from a roll. This cuts costly waste motion... saves time with each piece used. Segments of predetermined sizes also eliminate material waste. Adhesive back (either pressure-sensitive or solvent-activated) assures fast, positive application.

Is this your problem...

Protection against corrosion?

Protection against dissimilar-metal corrosion?

PRC Sealing tapes have special protective properties which safeguard your product against deterioration. Many sizes and impregnations are available for your specific needs.

PRC Write for descriptive literature.

PRODUCTS RESEARCH CO.

MFRS. OF CHROME LOCK AND KLING FELT TAPES

SUITE 31, 3126 LOS FELIZ BLVD.

LOS ANGELES 39, CALIFORNIA

MATERIALS HANDLING EQUIPMENT

Begins on page 158

Coil Grab

Grab has a prong tapered to fit between stacked coils, in the space made by the coil bands. As crane lifts, grab automatically adjusts to coil size. And as coil rises, grab turns to allow coil to move to vertical position.

Available in two models: for coils up to 12 inches wide, and for coils up to 24 inches wide. Capacity is 5000 pounds.

Dixon Automatic Tool, Inc., 2300 23rd Ave., Rockford, Ill.

■

For Rapid Fork Adjustment

Screw-adjusting forks are offered by Elwell-Parker for use on their complete line of gasoline and electric fork trucks.

Device consists of a frame you attach to the standard load elevator. Frame supports a pair of large-diameter screws which, in turn, support forks and move them laterally. You turn screws by large handwheels or a detachable crank handle.

Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland.

Turn the page

THOMAS Flexible ALL METAL COUPLINGS FOR POWER TRANSMISSION REQUIRE NO MAINTENANCE

Patented Flexible Disc Rings of special steel transmit the power and provide for misalignment and end float.

Thomas Couplings have a wide range of speeds, horsepower and shaft sizes:

½ to 40,000 HP

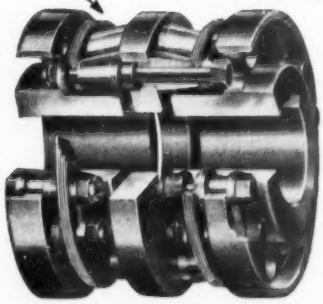
1 to 30,000 RPM

Specialists on Couplings for more than 30 years

BACKLASH FRICTION WEAR and CROSS-PULL are eliminated

Lubrication is not required!

PATENTED FLEXIBLE DISCS



THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT.

NO MAINTENANCE PROBLEMS.

ALL PARTS ARE SOLIDLY BOLTED TOGETHER.

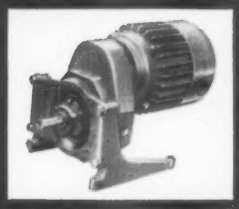
Write for the latest reprint of our Engineering Catalog.

THOMAS FLEXIBLE COUPLING CO.

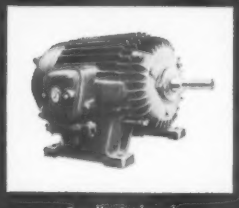
WARREN, PENNSYLVANIA

Superior Quality Makes Them The Best Buy In The Country

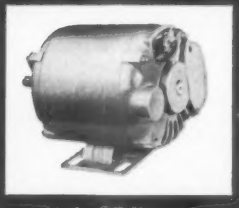
Vertical Hollow Shaft Pump Motor



Geared Motor, "SADI"



Totally Enclosed Fan Cooled Motor



Fractional Horsepower Motor

Industrial Sewing Machine Clutch Motor, "Super"

Open Drip Proof Motor

ACEC

FRACTIONAL and INTEGRAL HORSEPOWER ELECTRIC MOTORS

¼ hp. to 200 hp. —all available from stock

Priced below most other motors, ACEC motors offer you the electrical and mechanical excellence that results from over 70 years of experience and scientific research.

THREE-PHASE fractional and integral horsepower motors in ratings from ¼ hp. to 200 hp. are all available from stock. Branches and warehouses are located in New York, Chicago, Kansas City, New Orleans, Houston, Los Angeles—making possible immediate shipments out of warehouse inventories.

Manufactured strictly to NEMA FRAMES AND SPECIFICATIONS, ACEC Motors come in a wide variety of types to meet your motor needs. And 232 ACEC DISTRIBUTORS AND SERVICE SHOPS, located throughout the country, assure prompt and efficient fulfillment of your service requirements.

For top-level motor performance and utmost motor dependability *at lower prices*, write, wire or telephone our nearest representative—or communicate directly with us.

ALL ACEC MOTORS FULLY GUARANTEED

available in the following types:

- ★ **Open Drip Proof Motors**
- ★ **Totally Enclosed Fan Cooled Motors**
- ★ **Pump Motors**
  - **Style "C" Face Mounted**
  - **Style "P" Vertical Solid Shaft**
  - **Vertical Hollow Shaft**
- ★ **Industrial Sewing Machine Clutch Motors**
- ★ **Geared Motors and Capstans**

ACEC Motors

CHARLEROI

BELGIAN ELECTRIC SALES CORPORATION

Main Office: One E. 53rd St., New York 22, N. Y. • PLaza 8-3105

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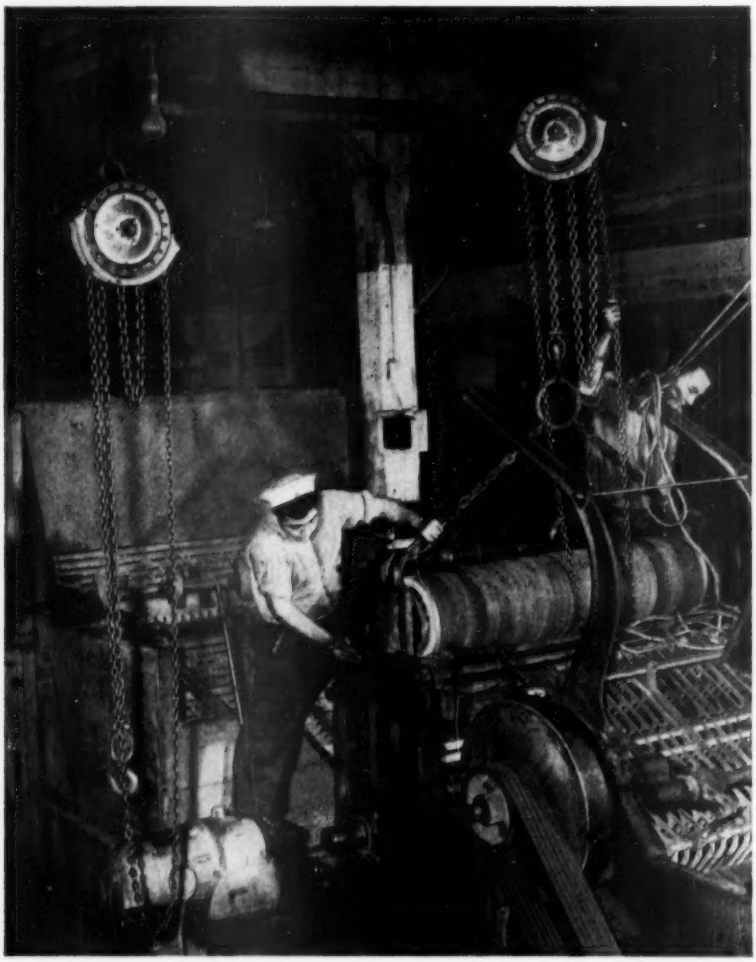
Youngstown • Savannah • Montreal • San Juan (Puerto Rico) • Mexico City



Peerless Model C Hoists are built for hard use

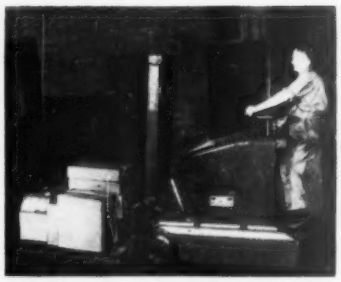
Peerless Hoists are designed to withstand hard use; to give long, troublefree service; to require minimum maintenance and repair; to provide maximum safety.

They have precision cut, heat treated alloy steel gears; all suspension parts of steel; frames of rolled steel; hooks and swivels of solid drop-forged steel; and hand wheels of die-pressed steel. The load chain is of heat treated, high carbon steel, the hand chains of electrically welded, heat treated steel. The load is directly supported on ball bearings, and gear train bearings have replaceable bronze bushings.

For a spur geared hoist that provides a lifetime of satisfactory service—at no premium cost—buy Peerless Model C. Write for Bulletin P-11 and the name of your nearest Harrington distributor.

HARRINGTON PEERLESS HOISTS

THE HARRINGTON COMPANY, 1660 W. Callowhill St., Phila. 30, Pa. • *Since 1876*



For Close Quarters

You can operate the Stoway electric stand-up fork truck within its own radius. It's especially useful on jobs where the operator must frequently mount and dismount.

Load-Center capacities are 2000 pounds at 24 inches, 2500 pounds at 15 inches, and 1650 pounds at 30 inches. Rolls at 6 mph. loaded; has four speeds forward and reverse. Fork heights range from 72 to 132 inches. Carriage tilts 4 degrees forward, 14 degrees backward.

Industrial Truck Div., Clark Equip. Co., Battle Creek, Mich.

■

Walk It or Ride It

You can dismount and walk this tractor on short hauls—or ride it when the run is longer. Comes in two models with either a 12- or 18-volt battery.

It has two walking speeds and a top riding speed of 4½ mph.

Operating handle goes to upright position when released and automatically sets brakes and cuts motors.

Moto-Truc Co., 1971 E. 59th St., Cleveland 3.

Turn the page

ARO AIR TOOLS
HELP GILLETTE GET
SUPER-SPEED PRODUCTION

SCREW-DRIVING. Aro Screwdriver, Model 7329-R, in special fixture made by Gillette to hold the Super Speed Razor during assembly of handle. Foot treadle actuates throttle. Aro's torque control very important here—drives screw to just-right tightness!

GRINDING. Aro Grinder, Model 7014, used by Gillette in preparing blade stock for processing in a continuous strip, coiled on reels.

Millions of Gillette Super Speed Razors have been assembled during the past five years with the help of ARO Air Tools.

Perhaps ARO can help you speed up production and cut costs in drilling, grinding, polishing, screw driving and other operations.

An ARO Field Engineer will gladly help in engineering your job or *contact your Aro distributor.*

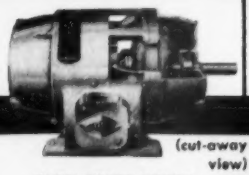
The Aro Equipment Corp., Bryan, Ohio
Aro Equipment of Canada, Ltd., Toronto, Ont.

The Leader! **ARO AIR TOOLS**

Also . . . LUBRICATING EQUIPMENT . . . HYDRAULIC EQUIPMENT . . . AIRCRAFT PRODUCTS . . . GREASE FITTINGS

DO THESE NEW
Reuland motors

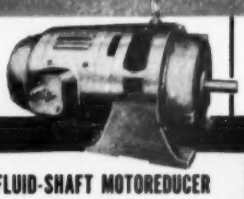
FIT INTO YOUR PICTURE?



(cut-away view)

FLUID-SHAFT MOTOR

Provides smooth acceleration of heavy loads. More compact than separate motor and fluid coupling. *Perfect alignment!* Thousands in use on cranes, mixers, centrifugals, etc.



FLUID-SHAFT MOTOREDUCER

This Fluid-Shaft motor and gear reducer combination converts the motor's conventional high speed into a slow speed, smooth starting, compact unit. Ideal for car pullers, conveyors, dryers, etc.

MAGNETIC BRAKE

The only brake that permits the use of TWO output shafts per motor. *When desired, the motor shaft can be extended right through!* Only 6 major parts... no levers or linkage... self adjusting . . . half usual length!

Write for new engineering folder on these and other *exclusive* Reuland Products... *industrial units designed to fill the needs of the nation's leading equipment manufacturers!*

RE **REULAND**
ELECTRIC COMPANY

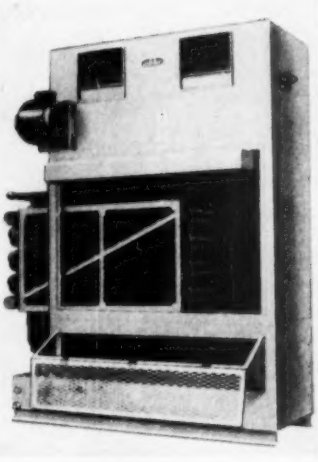
Alhambra, Calif. Representatives in all principal cities

FIRST IN QUALITY . . . FIRST IN DESIGN

WHAT'S NEW IN EQUIPMENT

Begins on page 158

AUXILIARY EQUIPMENT



Evaporative Condenser Has Sectional Components

This unit is designed for maximum flexibility of arrangement and service accessibility. You can remove all panels and sections, including coil, eliminator, blower, and air intake, and reset them in any of 16 different arrangements to meet your particular requirements.

Comes in 6 sizes with capacities ranging from 7½ to 40 tons.

United States Air Conditioning Corp., 3300 Como Ave., S. E., Minneapolis 14.

■

New Liquid Cooler

Features two copper tube circuits cast in a single aluminum block, making a rugged unit tested to 1500 pounds per square inch.

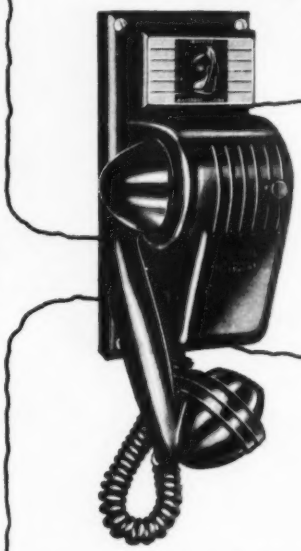
Coolant flows through one circuit; liquid to be cooled flows through the other.

Heat-X-Changer Co., Brewster, N. Y.

Turn the page

SOLVE THE PROBLEM OF
OVERLOADED
SWITCHBOARDS

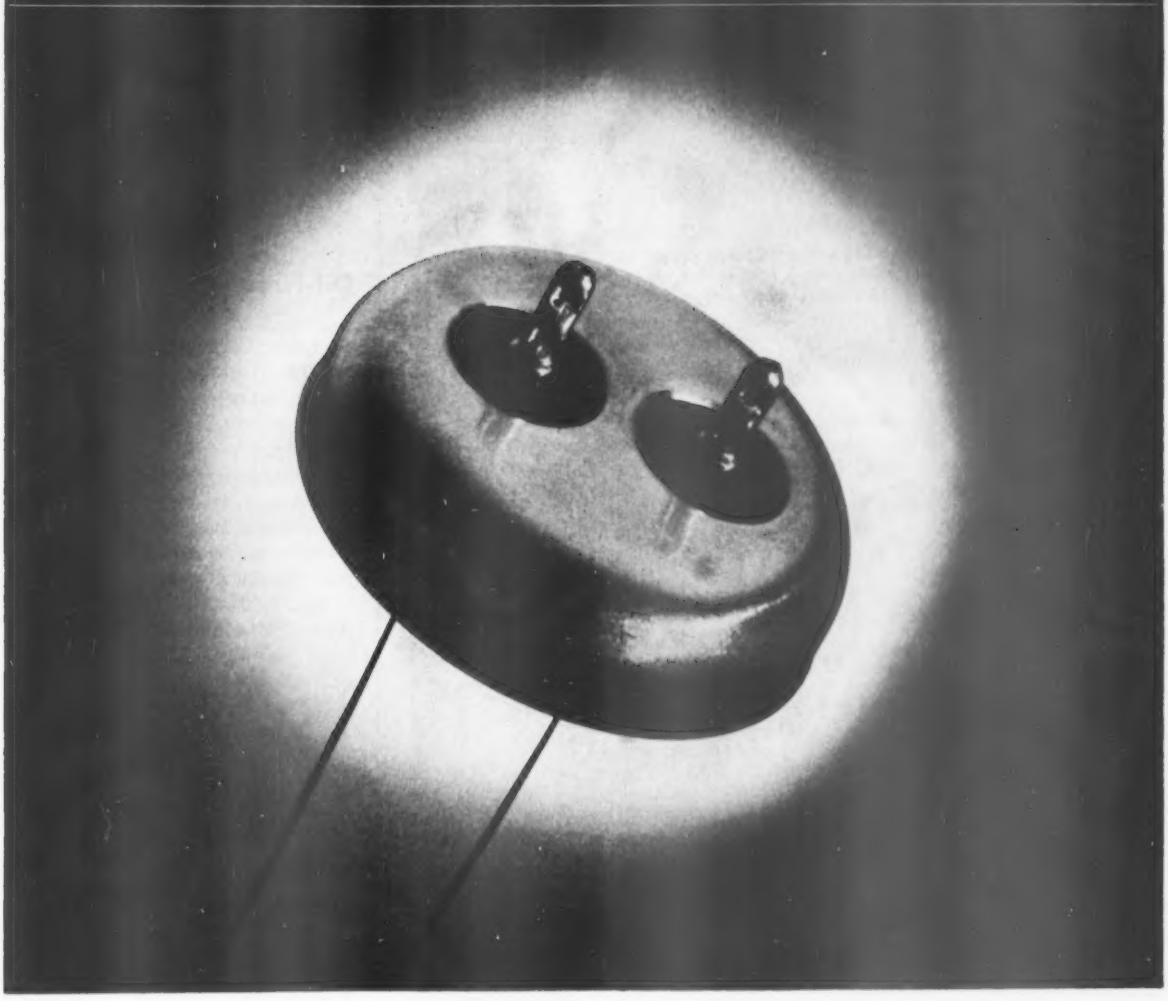
Quickly... Easily... Install
WHEELER
SOUND POWERED
Electric
TELEPHONES



Up to 12 frequently-called locations on this dependable intercom system will save your overloaded switchboard for urgent calls... save both time and money. NO BATTERIES ...NO OUTSIDE POWER... NOTHING TO REPLACE OR MAINTAIN. Free from electrical hazards. Ideal EMERGENCY standby. Meets many SPECIAL needs. Write now for full details.

the **WHEELER**
INSULATED WIRE CO., INC.
DIVISION OF THE SPERRY CORP.
1110 EAST AURORA STREET
WATERBURY, CONNECTICUT

You expect the best value from G-E fluorescent lamps



G-E puts crimp in pins to make better lamps

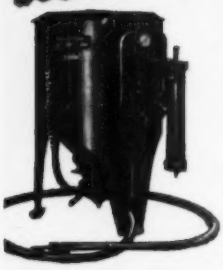
Up to now, the pins that hold a fluorescent lamp in its socket have always been fastened to the lead-in wires by soldering. Now General Electric bonds them together by crimping. Used in the new *G-E Rapid Start* fluorescent lamps, crimped pins are stronger. They're uniform in length and diameter. They don't corrode. They're easier to put into sockets. They provide more positive electrical connections. It's another example of why you can *expect* the best value from General Electric fluorescent lamps.

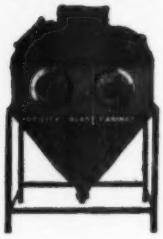
You can put your confidence in—

GENERAL ELECTRIC

Here's how Pangborn
Solves these Problems
with this modern equipment

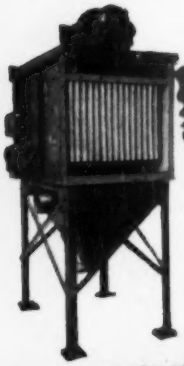
BLAST CLEANING!





Blast Cleaning Cabinet quickly and easily cleans rust, grime, dirt, paint, etc., from metal parts. Produces a clean, smooth surface on pieces up to 60" x 36". Models available from $319.00 and up.

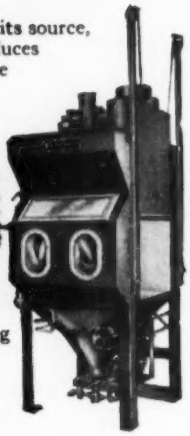
Blast Cleaning Machine not only removes rust, dirt, scale, etc., but is ideal for maintenance and many other uses. Cleans large objects such as bridges, structural work, tanks before painting. Six sizes, portable or stationary, from $170.00 and up.



DUST COLLECTING!

Unit Dust Collector stops dust at its source, minimizes machine wear and tear, reduces housekeeping and general maintenance costs. Solves many grinding and polishing nuisances. Reduces material losses. Models from $286.00 and up.

PRECISION FINISHING!



Hydro-Finish Cabinet uses liquid blast, eliminating dust, and reduces costly hand polishing, cleaning and finishing of molds, dies, tools, etc. Removes scale, discoloration and directional grinding lines, prepares surfaces for plating and coating. Holds tolerances to .0001". Models from $1410.00 and up.

LOOK TO PANGBORN FOR THE LATEST DEVELOPMENTS IN BLAST CLEANING AND DUST CONTROL EQUIPMENT

Pangborn

MAIL COUPON for full details

(Check for more information)

- ☐ Blast Cleaning Cabinets
- ☐ Blast Cleaning Machines
- ☐ Unit Dust Collectors
- ☐ Hydro-Finish Cabinets

PANGBORN CORP., 2100 Pangborn Blvd., Hagerstown, Md.

Gentlemen: Please send me more information on the equipment I've checked at the left.

Name.....

Company.....

Address.....

City.....Zone.....State.....

NEW AUXILIARY EQUIPMENT

Begins on page 168

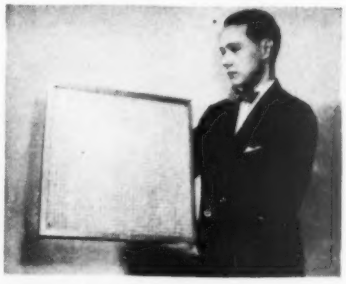
Oil-Fired Air Heater

Just flick a switch and this portable air heater will deliver 375,000 Btu. on 2.75 gallons of No. 2 fuel oil per hour. Operates on 110-volt, 60-cycle, single-phase current and has thermostatic control.

Heavy-gage steel body weighs 325 pounds, rolls on rubber-tired wheels. Takes fuel from delivery container via hose.

A. C. Bauman, 7037 Grays Ave., Philadelphia 42.

■



You Can Wash This Plastic Filter

Clean the new Pliotron plastic air filter in a few minutes by just rinsing it in clear water—and put it back to work immediately without drying.

Filtering agent contains permanent electrostatic charge that traps the finest pollen, soot, and dust particles.

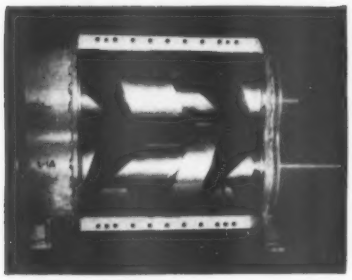
Made in four sizes, all 1 inch thick: 16x20 inches, 16x25 inches, 20x20 inches, and 20x25 inches.

Dept. 722, Goodyear Tire & Rubber Co., Akron.

Turn the page

NEW AUXILIARY EQUIPMENT

Begins on page 168



Screw-Rotor Compressor

Instead of conventional rotors, "Spiraxial" compressor employs two intermeshing screw-rotors that rotate in opposite directions.

Unit delivers 1115 cfm. of air or gas at 1750 rpm. and 20-lb. discharge pressure.

Peak efficiencies at discharge pressure are determined by requirements. Other features: no internal lubrication needed, minimum of servicing with wearing parts quickly accessible, low noise level, and light weight.

Roots - Connersville Blower, Connersville, Ind.

■

Compact TV Camera

Its no larger than your bulky brief case. And it's a completely self-contained portable industrial unit that televises to one or several standard receivers, with all controls at the camera. You can use it in daylight or normal room light. Simple to operate, too. If you can tune your home receiver, you can operate this unit, say makers.

Dage Electronics Corp., 69 N. Second St., Beech Grove, Ind.

Pangborn CH Dust Collectors installed outside the Kingsbury shop collect dust from painting and finishing operations via booths and hoods.

One Pangborn Installation Solves 6 Dust Control Problems!*

Hoods exhaust dust from hand polishing and grinding booths to outside Collectors

FINISHING operations at Kingsbury Machine Tool Corporation presented a 6-fold dust control problem to Pangborn engineers. Several priming, lacquering and spray painting operations had to be protected from dust created in other finishing jobs such as snagging, grinding and smoothing.

To control these dusts efficiently, Pangborn recommended booths, tables and exhaust hoods. Four main booths, four snagging tables, one snagging bench and a bench grinder hood control the dust at the source. All these are exhausted to two CH Collectors located out-of-doors.

Kingsbury reports the complete system "highly satisfactory"—with these added benefits: Heating costs have been lowered substantially through recirculation of the cleaned air. Costly dust damage to adjacent machinery and products has been prevented. And workers' efficiency has increased due to cleaner working conditions.

What are your Dust Problems? Find out what Pangborn can do to solve them. Write today for Bulletin 909A. Address: PANGBORN CORPORATION, 2100 Pangborn Blvd., Hagerstown, Md.

Look to Pangborn for the latest developments in Dust Control and Blast Cleaning equipment

Pangborn DUST CONTROL

STOPS THE DUST HOG from stealing profits

these LITTLE DIFFERENCES mean

BIG ADVANTAGES when you specify

CAMBRIDGE INDUSTRIAL WIRE CLOTH

#1. Some manufacturers assign only one operator to as many as ten looms. But here at Cambridge, we have a specially trained operator for every single loom in the plant. Just a little difference . . . but a BIG advantage in accurate mesh count and constant screen width.

#2. Some wire cloth producers can work in only a certain few metals or in a limited range of mesh sizes. Here at Cambridge we can weave cloth from any metal that can be drawn into wire... our range of sizes runs from 20 x 250 mesh up to 4 inch openings ...a BIG advantage for customers with varied needs.

#3. Some manufacturers are not equipped to fabricate wire cloth into special forms, for example, filter leaves. But here at Cambridge, we can supply wire cloth in bulk or in practically any type of fabricated part . . . a BIG advantage that saves you time and money by providing one source for both weaving and fabrication.

These are just a few reasons why it will pay you to investigate Cambridge for your wire cloth needs. Call in your Cambridge Field Engineer to get the full story . . . and he'll gladly quote on your next order. Write direct or look under "Wire Cloth" in your classified telephone book.

FREE CATALOG! Gives full range of mesh sizes and types of cloth available from Cambridge, also valuable metallurgical data. Write for your copy today.

The Cambridge Wire Cloth Co.

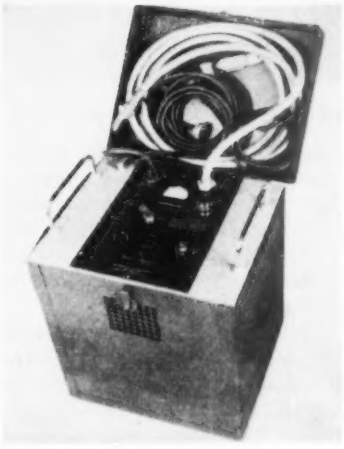
WIRE CLOTH | METAL CONVEYOR BELTS | SPECIAL METAL FABRICATIONS

Department E
Cambridge 1, Maryland

OFFICES IN PRINCIPAL INDUSTRIAL CITIES

Begins on page 158

ELECTRICAL EQUIPMENT



For Cable and Proof Testing

You apply impulse along disconnected cable. When you come to a trouble spot, you hear a loud, cracking noise like a pistol shot. The "shot" is repeated at approximately 1- to 3-sec. intervals—no instruments to read, no calculations to make.

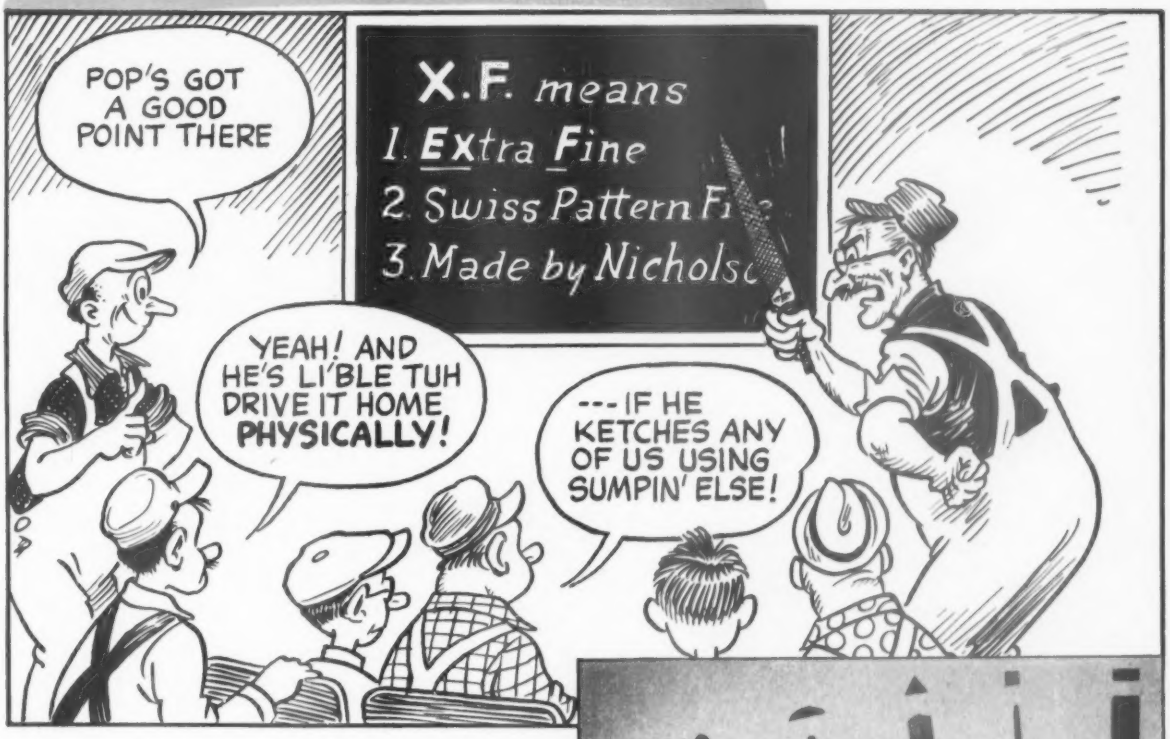
This light, portable unit, called the Faultfinder, quickly and accurately finds insulation faults by subjecting cable to instantaneous, but non-damaging, high d-c voltage. You can test various types of cables up to 15 kilovolts.

And you can use the Faultfinder to proof-test equipment up to 15 kilovolts — motors, transformers, and similar electrical units with an adjustable d-c voltage. Unit indicates loss of voltage on panel voltmeter. It checks on the soundness of your repairs and makes sure that no additional defects exist.

Electrical Distributors Co., Liberty Trust Bldg., Philadelphia 7.

Turn the page

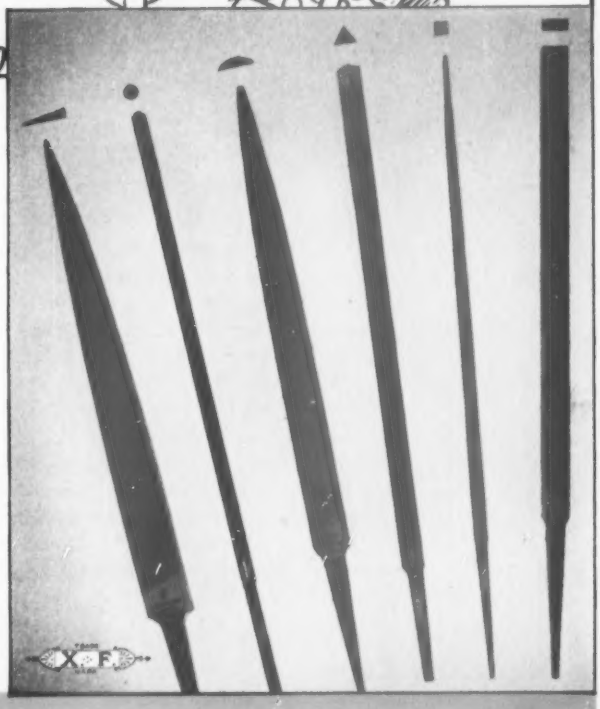
POP'S school of filing


POP'S GOT A GOOD POINT THERE
X.F. means
1. Extra Fine
2. Swiss Pattern Fi
3. Made by Nichols
YEAH! AND HE'S LI'BLE TUH DRIVE IT HOME PHYSICALLY!
---IF HE KETCHES ANY OF US USING SUMPIN' ELSE!

THEY can't put anything over on Pop. He knows (as most good foremen know) that where there's precision filing to be done, there are specially precise files for doing it, viz.: Nicholson X.F. Swiss Pattern Files. He knows, too, that "X.F." means "*Extra Fine*." And for good reason: With 89 years' file-making experience and more Swiss Pattern production than any other manufacturer in America, Nicholson can well be expected to turn out the absolute tops in accurate shapes and cuts and the utmost in quality.

SOLD THROUGH INDUSTRIAL DISTRIBUTORS in all popular individual types; and in such special groups as Die Sinkers Files, Round and Square Handle Needle Files, Filing Machine Files; Silversmiths and Die Sinkers Rifflers. FREE CATALOG.

NICHOLSON FILE COMPANY
27 Acorn Street, Providence 1, R. I.
(In Canada, Port Hope, Ont.)



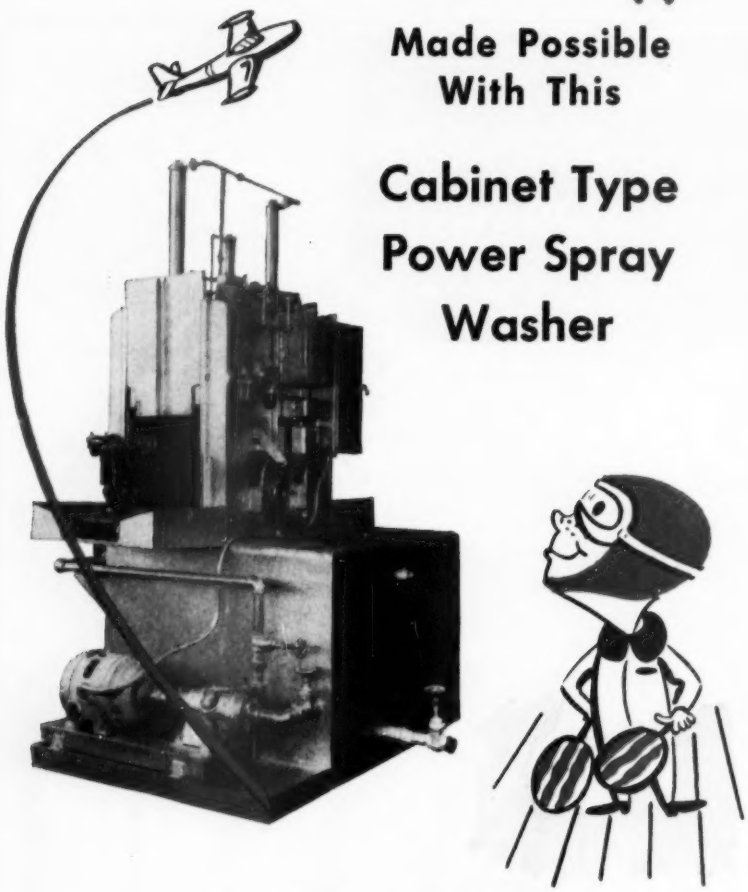
NICHOLSON FILES FOR EVERY PURPOSE

PD

Clean Take-Offs

Made Possible With This

Cabinet Type Power Spray Washer



Indicative of the versatility of Peters-Dalton engineers is the Industrial Washing Equipment illustrated above. It is a type of installation that can only be utilized by a few specialized manufacturers. This Cabinet Type Power Spray Washer has been designed for washing aircraft engine cylinders after machining—a most important step in meeting the high standard of finishing required for vital parts such as these.

Catch-all methods are not satisfactory for industrial washing needs. Metal cleaning equipment should be designed for the specific product and process. PD engineers, with their extensive background of experience and knowledge in this field, are available to discuss your problems for between-operation cleaning or paint preparation. If you would like us to tell you more—write, wire or phone.

Paint Spray Booths *Drying and Baking Ovens*
Dust Collecting Systems *Industrial Washing Equipment*

PD Peters-Dalton INC.
17918 Ryan Road • Detroit 12, Michigan

NEW ELECTRICAL EQUIPMENT

Begins on page 172

For Safer High-Voltage Fuse Handling

This gang-operated fuse compartment de-energizes fuses on high-voltage motor controls, making them safe and convenient for handling.

When you open the fuse compartment door, the fuse panel is automatically pulled to the front of the compartment, disconnecting the fuse panel from the line and putting the fuses within easy reach.

Electric Machinery Mfg. Co., Minneapolis 13.

■

Handy Test Light

Glows on 80 to 600 volts, a-c or d-c, with intensity indicating relative voltage. And you get a long reach with 24-in. leads of heavily insulated, 10,000-volt wire. Long handles have safety rings to prevent fingers slipping onto prods.

Ideal Industries, Inc., 1414 Park Ave., Sycamore, Ill.

Turn the page

YOU TELL US... what you need in IMPACT

- sockets
- extensions
- adapters
- universal wrenches

90% of all nutrunning problems can be solved efficiently and economically by using one or more of the thousands of stock types and sizes of Apex sockets, extensions, adapters and universal wrenches.

And, if your operations come under the special 10%, you'll still find the answer at Apex. For Apex will build tools to meet your specific nutrunning requirements.

If you're plagued by tool breakage or quick wear-out, you don't have to compromise on tools that merely come close to your requirements—Apex will build tools to match your requirements exactly.

We'd suggest you look through Catalog 29 first (just drop a line on your company letterhead for your copy). If you don't find the solution to your nutrunning problem there, then send us a sketch or blueprint outlining your particular problem. We'll quote promptly, without any obligation to you.

APEX TOOLS

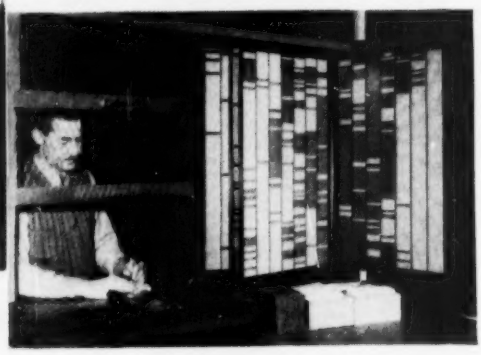
sockets, extensions, adapters

THE APEX MACHINE & TOOL COMPANY

1026 S. Patterson Blvd., Dayton 2, Ohio

POWER BITS, INSERT BITS AND BIT HOLDERS, FOR PHILLIPS, FREARSON (Reed & Prince), SLOTTED, CLUTCH HEAD and SOCKET HEAD SCREWS • HAND DRIVERS FOR PHILLIPS, FREARSON AND CLUTCH HEAD SCREWS • TWO-PIECE DRIVERS FOR HEX HEAD SCREWS • SOCKETS, EXTENSIONS, ADAPTERS AND NUT SETTERS • UNIVERSAL SOCKETS, EXTENSION WRENCHES AND ADAPTERS • AIRCRAFT AND INDUSTRIAL UNIVERSAL JOINTS • SELF-RELEASING AND ADJUSTABLE STUD SETTERS • SAFETY FRICTION TAPPING CHUCKS • VERTICAL FLOAT TAPPING CHUCKS.

SEE US AT BOOTH 512
PLANT MAINTENANCE SHOW



DAYTON PUMP
benefits 10 ways

.....saved $12,957 with McCASKEY TOOL CONTROL

In their first three months' use of McCaskey Tool Control, the Dayton Pump and Mfg. Co. reduced tool expense $12,957 with the continuing improvements outlined below. Ten good reasons why they are enthusiastic over their results, briefed from facts received from Mr. Louis Wozar, Vice Pres. and Assoc. Gen. Mgr:

1. **Idle Tools Recovered** . . . inventory of all special and standard tools, taken during McCaskey installation, revealed amazing quantity held in tool boxes and benches for only occasional jobs.

2. **Tool Inventory Reduced 20%** . . . by requiring operators to return tools not in use . . . by determining through tool usage records (1) proper inventory levels and (2) quantities to be purchased.

3. **Less Tool Breakage** . . . McCaskey procedure has made operators "tool conscious" and careful, reducing breakage.

4. **Crib Performance More Efficient** . . . McCaskey Index and Location Boards instantly provide tool number, description, size and location of all standard tools, special tools, jigs and fixtures; also show whether used on active or service parts and facilitate storage of more tools in less space.

5. **Argument and Accusations Stopped, Productive Hours Increased** . . . tools in operators' possession quickly, definitely located.

6. **Blueprints Quickly Located** . . . eliminates confusion and delay, when prints are recalled, and prevents costly errors from use of obsolete prints not turned in or found.

7. **Accurate Tool Usage Records** . . . now available for quick check-up on performance data and obsolescence.

8. **Perpetual Inventory** . . . accurate, up-to-the-minute record of available tools easily maintained by positive procedure.

9. **More Productive Time for Machines, Tools and Men** . . . thru faster crib service . . . no lost motions . . . no dependence on attendants memory . . . no laborious clerical work.

10. **Efficient Operation with Inexperienced Attendants** . . . new personnel quickly and easily trained for smooth, efficient operation.

These advantages point to continued savings for Dayton Pump . . . and for you, too. Investigate NOW! Mail coupon for step-by-step procedure and additional facts.

THE McCASKEY REGISTER CO.
ALLIANCE, OHIO

Send me complete facts on McCaskey Tool Crib Control.

Name .....

Position .....

Company .....

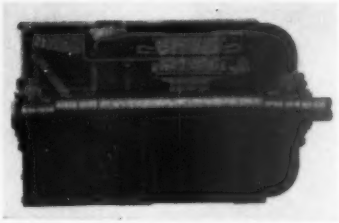
Address .....

FMM 1-53

McCaskey
INDUSTRIAL CONTROLS
PRODUCTION • INVENTORY
TOOLS • COSTS • PAYROLL
THE McCASKEY REGISTER CO.
ALLIANCE, OHIO
McCaskey Systems, Ltd., Galt, Canada
The McCaskey Register Co., Watford, England

NEW ELECTRICAL EQUIPMENT

Begins on page 172



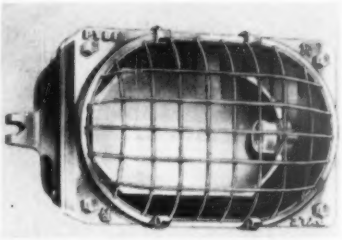
Compact High-Slip Motor

It's 30% smaller and 40% lighter than conventional totally enclosed fan-cooled high-slip motors, says the manufacturer.

Size and weight are cut by extending low-resistance rotor bars to high-resistance fan blades which provide higher rotor resistance necessary for high-slip characteristics. Rotor heat develops outside motor enclosure—where there is a direct transfer to cooling air. Available in 30 to 150 hp. at 900 and 1200 rpm., 5% and 8/13% slip. Voltage ratings are 220, 440, and 550.

General Electric Co., Schenectady 5, N. Y.

■



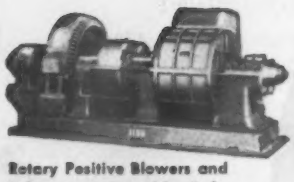
Vaporproof Floodlight

You can recess or surface-mount it in your maintenance pits, underpasses, subways, and other locations subject to heavy moisture where you need efficient lighting. Reflector can be adjusted to throw beam 18 degrees upward or downward from center.

Plain glass face is heat- and impact-resistant. Slots drain off water on cover.

Pyle-National Co., 1334 N. Kostner Ave., Chicago 51.

Turn the page

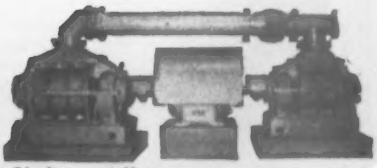


Rotary Positive Blowers and Exhausters—*capacities 5 cfm to 50,000 cfm.*

Rotary Positive Gas Pumps—*capacities 5 cfm to 50,000 cfm.*

CENTRIFUGAL BLOWERS AND EXHAUSTERS—built in single and multi-stage units, in capacities from 2,000 cfm to 100,000 cfm or higher, at maximum practical pressures. Standard designs meet most applications. Special units designed and built for unusual needs.

Inert Gas Generators—*capacities 1,000 cfh to 35,000 cfh.*



Cycloidal Vacuum Pumps—*capacities 500 cfm to 13,000 cfm.*

Positive Displacement Meters—*capacities 4,000 cfh to 1,000,000 cfh.*

WE *Specialize* IN YOUR PROBLEMS OF MOVING GAS OR AIR!

Your business probably *is* different when it comes to handling gas or air. You may want to move a thimbleful of gas—or create a cyclone of whirling air. But, no matter how your problem differs from your neighbor's, the chances are that we've met something pretty close to it, in our almost a century of experience of building such equipment.

Another reason why we know so much about this job is that it's all we do. Our customers range from the "giants of industry" to the neighborhood plant, both of whose production depends upon continuous, reliable, economical performance of air and gas handling units. Because we build the exclusive *dual-ability line* of Rotary Positive and Centrifugal Units, in a wide range of sizes, we offer a *dual choice* not available from any other maker—which permits completely unbiased recommendations.

So—if you have a problem today—or anticipate one a year or five years from now, we suggest you call upon the R-C Specialists—to give you a long-time, satisfactory answer. Write for bulletins on any specific equipment.

ROOTS-CONNERSVILLE

Exclusive Specialists in Handling Gas and Air

ROOTS-CONNERSVILLE BLOWER

A DIVISION OF DRESSER INDUSTRIES, INC. • 153 CENTRAL AVE. • CONNERSVILLE, INDIANA

Only **THE DUMORE®**

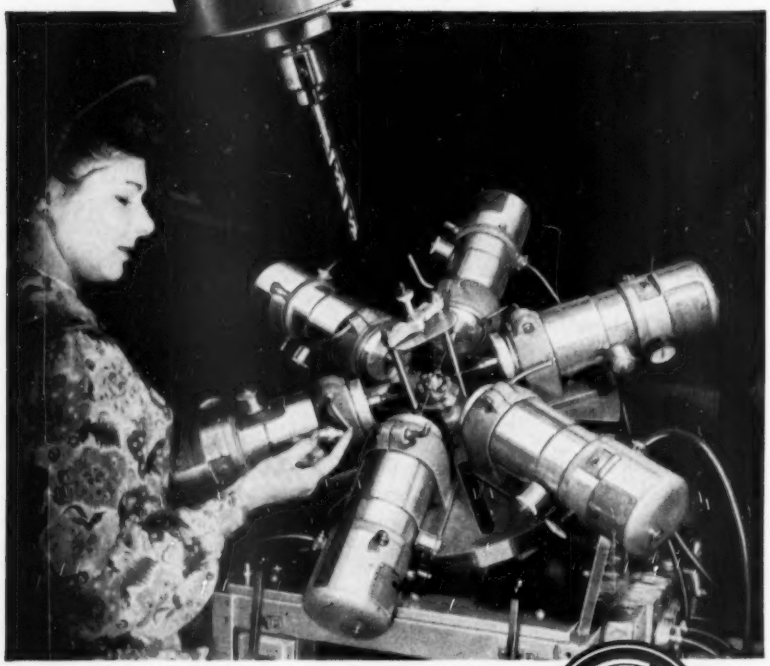
Automatic Drill Head offers the technique of "Resistance Drilling"... eliminates drill breakage

UTILIZING an entirely new drilling technique . . . "resistance drilling" . . . the Dumore Automatic Drill Head is proving it can virtually eliminate drill breakage when used for small-diameter, deep-hole drilling operations.

With "resistance drilling," the workpiece determines the rate of drill feed and speed. The tool always maintains uniform pressure. No need to rely on operator guesswork. Permits working closer to the maximum strength of the drill.

Based on proven field results under average conditions, this tool has set remarkable production records when operating with these drill diameters: up to 3/32" in steel; up to 1/8" in brass, aluminum, zinc and cast iron; up to 5/32" in plastics and wood.

Get all of the advantages of this amazing shop tool. Specify the Dumore Automatic Drill Head. Ask your nearby industrial distributor for a demonstration, or write to The Dumore Company.

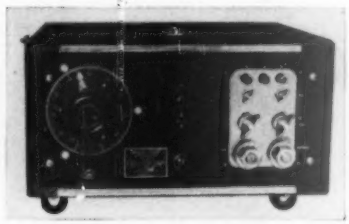


This unusual setup is typical of the many ways that the Dumore Automatic Drill Head can save costs on a production problem. Here, labor costs on bronze nozzle holders were slashed $75 on the first run of 5273 pieces.

THE DUMORE COMPANY
1341 Seventeenth Street • Racine, Wisconsin

NEW ELECTRICAL EQUIPMENT

Begins on page 172



High-Current Test Unit

You can test and calibrate heavy equipment, dry out windings, and make "heat runs" on wires, connectors, switches, and sockets with the Multi-Amp Model 1005.

Output is accurately adjustable in stepless increments from 0 to 1000 amperes in eight ranges. Each range is rated at 2.5 kva. on a 4-hour duty cycle. Terminal voltages are fully adjustable from 0% to 115% of 200, 100, 75, 50, 25, 10, 5, and 2.5 volts.

Multi-Amp Corp., Harrison, N.J.

■

TYPE "C" COMMSTONE HOLDER keeps Commstones rigid and true for concentric resurfacing of commutators and slip-rings while running at normal speeds in their own bearings. Flexible cross-feed handle that can be deflected to one side and 3¾-in. width of unit make it handy for jobs in close quarters. With Commstones, bars up to 4¾ inches long can be ground. With 2-in. box, you can grind commutators and slip-rings from 1 to 3¼ inches wide. Martindale Electric Co., 1393 Hird Ave., Cleveland 7.

■

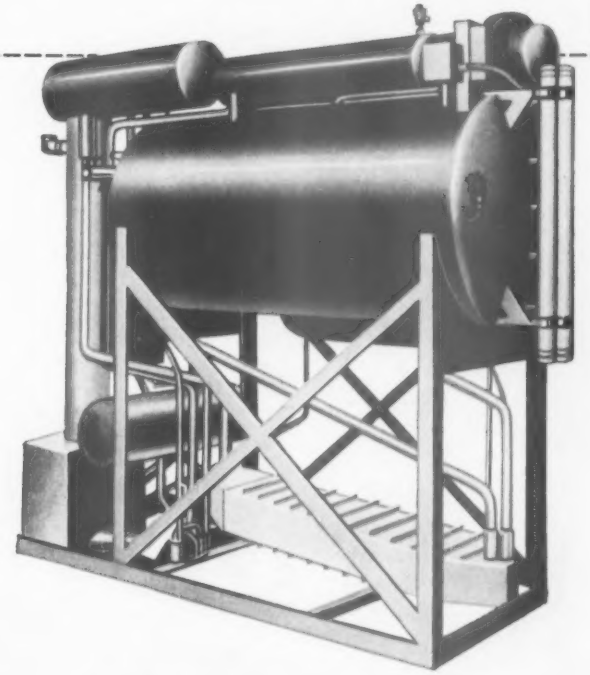
FIVE NEW TAPES are added to the Permacel line by Industrial Tape Corp., New Brunswick, N. J. All have adhesives that will not soften under temperatures of 300F. to 400F. And applications range from use on fine wire constructions to winding heavy-duty coils.

Turn the page

Solve cooling problems with waste heat or low-cost steam!

FLEXIBLE SERVEL WATER CHILLER

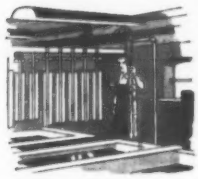
meets all 3 cooling needs



1. AIR CONDITIONING

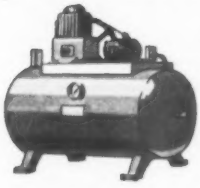
The adaptable Servel 25-ton Water Chiller—operating on any source of steam—uses water as the refrigerant to provide economical temperature and humidity control in large buildings and factories. No expensive duct systems are required!

2. PROCESS COOLING



Because it operates with no moving parts on the time-proved absorption refrigeration principle, you can depend upon the Servel 25-ton Water Chiller for continuous high-efficiency cooling of liquids for various manufacturing and formulating processes.

3. INDUSTRIAL PRECOOLING



You can use the unusually flexible Servel 25-ton Water Chiller to precool air for increased capacity and improved performance of air compressors and internal combustion machines. The Water Chiller also serves other money-saving precooling purposes.

5-YEAR WARRANTY! Every Servel 25-ton Water Chiller is backed by a full 5-year warranty. Because it has no moving parts, the Servel Water Chiller operates quietly and without vibration. Add to these advantages its extremely compact size and light floor weight and you'll appreciate why it can be installed on any floor with most economical piping arrangement. May be installed singly or in multiple as required. Mail the coupon below today for complete information.

Servel

the name to watch for great advances in . .

AIR CONDITIONING ✓ REFRIGERATION

MAIL THIS COUPON TODAY

SERVEL, INC., Dept. FM-1, Evansville 20, Indiana

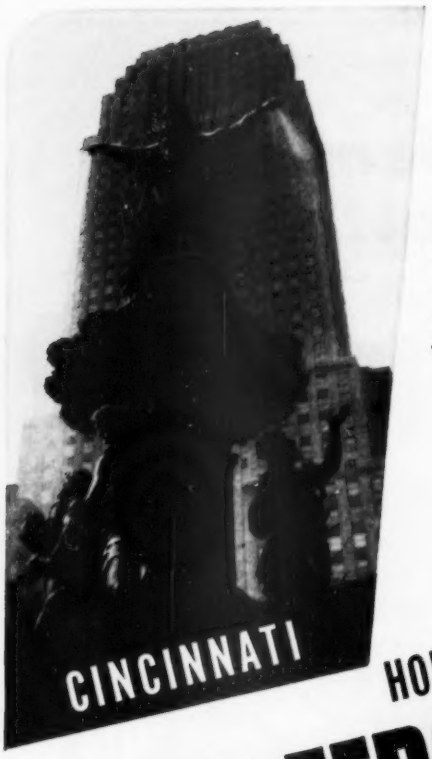
Please send me further information about application flexibility of the Servel 25-ton Water Chiller.

Name _____

Firm _____

Address _____

City _____ Zone ___ State _____



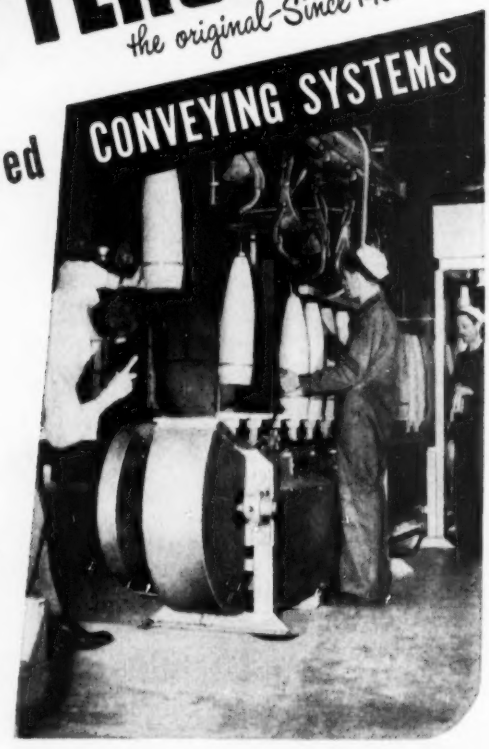
THE "HEART" OF CINCINNATI is famous Fountain Square. The pulsating "life blood" of the city, however, flows from its famous industries, which generation after generation have produced fine quality machine tools, pianos, ink, soap, radios, television sets and conveying systems—A-F Engineered Completely Co-ordinated Conveying Systems!

CINCINNATI HOME OF

ALVEY-FERGUSON

the original-Since 1901

engineered CONVEYING SYSTEMS



A-F YOU can *SEE* the SUPERIORITY of ALVEY-FERGUSON Conveyor ENGINEERING

For a discussion of latest efficient handling methods write:

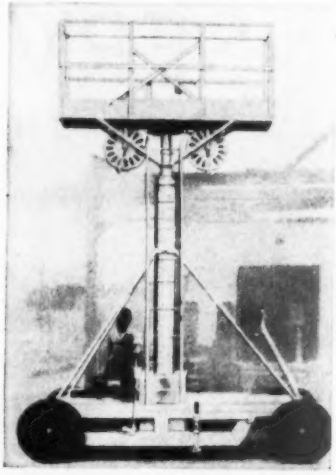
THE ALVEY-FERGUSON COMPANY

A-F 131 Disney Street, CINCINNATI 9, OHIO • OFFICES OR REPRESENTATIVES IN PRINCIPAL CITIES

WHAT'S NEW IN EQUIPMENT

Begins on page 158

MAINTENANCE TOOLS & SUPPLIES



Hydraulic Personnel Lift

You can give your maintenance crew a 38-ft. boost, with as much as 6000 pounds of equipment, on this 8-ft. platform which can be rotated 360 degrees. Dual controls are provided—one set on the ground, the other on the platform.

Hydraulic column is driven by a 7½-hp. Wisconsin engine with self-starter. Fully retracted with guard rail collapsed, the unit needs only 13½ feet of clearance.

Base is equipped with four stabilizing screw jacks on folding arms for use with high lifts.

Additional safety features include slow, controlled descent in case a hydraulic line is ruptured, a bypass valve for lowering if controls fail, a strong railing, and a 6-in. kickboard around the platform to prevent loss of tools.

Hamlin-Klock Corp., Pasadena 1, Calif.

Turn the page

GRITCLOTH
TOMORROW'S SANDING FABRIC TODAY!
USE WET OR DRY
BAY STATE (R)
NON-CLOGGING
USE BOTH SIDES
No. 320 GRITCLOTH
By Machine or Hand
FLAT OR FOLDED
WESTBORO, MASS.
LONG LIFE
10 to 15 TIMES LONGER LIFE
THOUSANDS OF SUPER-SHARP EDGES THAT KEEP ON CUTTING
BAY STATE
ANOTHER SPARKLING BAY STATE "FIRST"!
Once and for all, GRITCLOTH solves the age-old problem of clogging sandpaper and other types of coated papers. GRITCLOTH'S revolutionary open-mesh design lets the removed particles flow right through, and the sharp abrasive teeth keep right on cutting. Actual tests show 10 to 15 times the life of ordinary coated papers.
For all finishing jobs on either wood or metal, IT'S GRITCLOTH TODAY.
IT'S NEW IT'S BETTER IT'S BAY STATE
BAY STATE ABRASIVE PRODUCTS CO., WESTBORO, MASS., U. S. A.
Branch Offices and Warehouses — Chicago, Cleveland, Detroit, Pittsburgh
Distributors — All principal cities
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

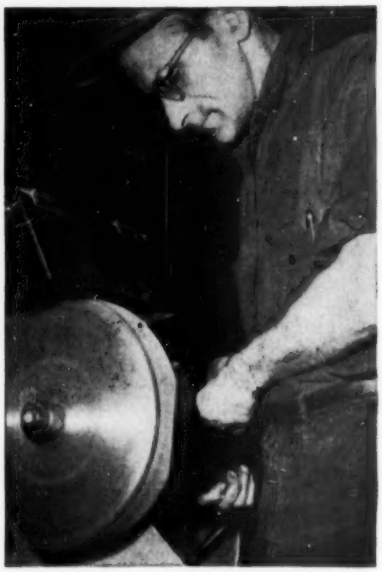
Backstand Belts Triple Production!

Three times as many steel guides sanded per hour using ARMOUR Backstand Belts!

In sanding beveled edges of a steel guide for vending machines, a prominent company* decided to use backstand belts instead of set-up wheels. The switch *increased production from ten to thirty guides per hour!* Here is more proof that Armour backstand belts are more efficient, more economical than set-up wheels.

Belts are only one of the many forms of coated abrasives available to you from Armour. There are more than 30,000 different varieties in grit size, backing, etc. We have sheets, discs, rolls, tubes—and specialty sizes to meet your specifications. Your industrial supply distributor will be glad to tell you about this complete Armour line. Call him today!

Mail the coupon below for your free copy of our useful booklet, "Backstand-Belt Polishing."



*Name of company available on request.

We recommend buying through your industrial distributor.

ARMOUR

Coated Abrasives

MAIL THIS COUPON TODAY!

Armour and Company • North Benton Road • Alliance, O.

Please send me the free booklet, "Backstand-Belt Polishing."

*Name*_____ *Title*_____

*Firm*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

NEW MAINTENANCE TOOLS & SUPPLIES

Begins on page 180

For Dust-Free Masonry Cutting

A constant water spray sweeps away all dust and material particles when you're sawing refractory and masonry materials with this unit. And you can set it up right at the bricklaying or furnace-lining job — it's no longer necessary to carry sawed material long distances from the saw to the job.

A hinged blade guard protects operator from flying particles and water spray.

Eveready Briksaw Co., 1509 S. Michigan Blvd., Chicago 5.

For Slipperier Snow Plow Blades

Snowbound lately? You can get out from under 30% faster by spraying or brushing Snow-Rem Universal wax on your plow blades, mold-boards, and wings, according to manufacturer.

Saves you maintenance expense by cutting motor fuel consumption and eliminating need for thinning ordinary waxes for spray use, or stocking both spray and brush wax. Snow-Rem is said to be an effective anti-rust coating, for good measure.

Contains high Carnauba content and a silicone additive. Comes in 5-gal. cans or 55-gal. drums.

Speco, Inc., 7308 Associate Ave., Cleveland 9.

Turn the page

Remember how you longed for air conditioning last summer?

You swore you'd never go through another summer without air conditioning. Now—today—is the time to do something about next summer. Here's why:

Your Westinghouse Contractor isn't rushed now. His men can install your new unit faster, better . . . without overtime. He will save you money. And he will do the work when it suits *you*—without disrupting your business.

It will pay to select Westinghouse equipment because:

Westinghouse costs less to operate. Its refrigerant-cooled motor saves on electric power and upkeep. Its hermetically-sealed design means less maintenance, fewer service calls.

Westinghouse gives better performance. Only Westinghouse designs and builds all components. This means smoother operation and longer life, because all parts have been precision-built to work together.

Westinghouse has a full equipment line. Whatever you require, from 2 tons up, a Westinghouse system will match your needs. Only Westinghouse offers so complete an air conditioning line.

Interested? Want to do some advance planning? Then send for the Westinghouse Planning Guides. Or better still, call your local Westinghouse Air Conditioning Contractor for a free estimate. He'll be glad to help you. He's listed in the Yellow Pages of your classified directory.

YOU CAN BE SURE...IF IT'S

Westinghouse

AIR CONDITIONING

J-80285

Westinghouse Electric Corporation
Air Conditioning Division
176 Damon Street
Hyde Park, Boston 36, Mass.

☐ Send me the "Planning Guide for Industrial Air Conditioning".

☐ I want a free estimate of the cost of air conditioning my premises.

Name.....

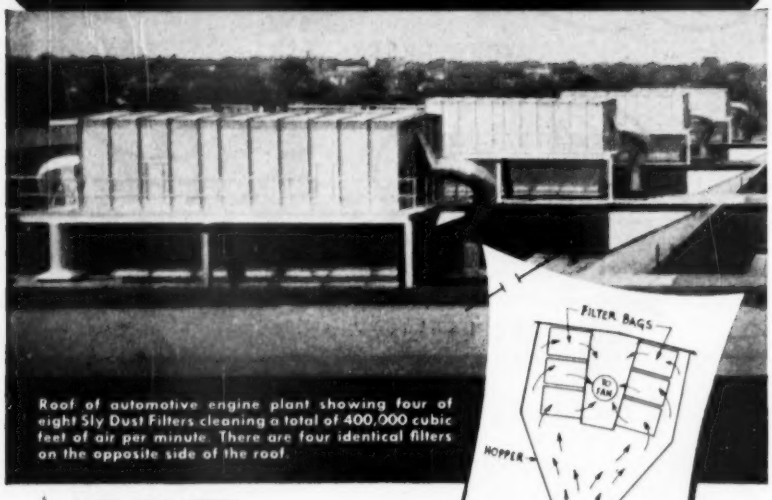
Company.....

Address.....

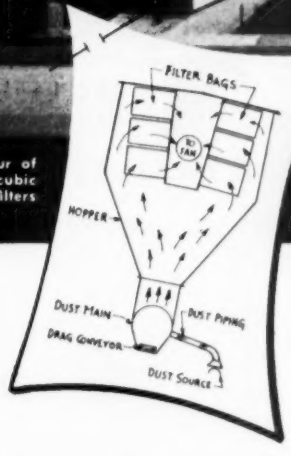
City.....Zone.....State.....

SLY PIONEERS & LEADERS

INDUSTRIAL DUST CONTROL



Roof of automotive engine plant showing four of eight Sly Dust Filters cleaning a total of 400,000 cubic feet of air per minute. There are four identical filters on the opposite side of the roof.



DUST...

RECLAIMED—
RE-MELTED—
RE-USED

Here are four of the eight Sly Dust Filters which exhaust the dust from milling machines in a large automotive engine plant.

Dust from machining engine blocks and other operations, is exhausted into hoods over the machines, thence into mains and through the hoppers into the filters; the collected dust drops into hoppers thence into the mains and is re-claimed —briquetted, and re-melted.

Aside from the recovery of valuable materials, the use of Sly Dust Filters results in a clean plant and better working conditions.

Because of their larger filtering capacity and easy replacement of bags, Sly Dust Filters offer definite advantages in economy of operation and lower maintenance.

If you will tell us your dust problem we shall be glad to tell you what can be done about it and give you an estimate of cost.

THE W. W. SLY MANUFACTURING CO.
4755 TRAIN AVENUE • CLEVELAND 2, OHIO
BRANCHES IN:
NEW YORK • CHICAGO • PHILADELPHIA • SYRACUSE • DETROIT • BUFFALO
CINCINNATI • ST. LOUIS • MINNEAPOLIS • BIRMINGHAM • LOS ANGELES • TORONTO

NEW MAINTENANCE TOOLS & SUPPLIES

Begins on page 180

Faster Asphalt Roofing

Non-rotting Fiberglas Corotop roofing mat and Fiberglas Corotop liquid asphalt team up to give you a heavy-duty, weather-tight surface for old or worn asphalt roofs.

You apply liquid cold by brush or spray—eliminates on-the-job fire hazards. A 4-man crew, makers say, can lay as much as 40,000 square feet of Corotop a day to give you faster, more economical roof maintenance.

Corotop mat weighs 2 pounds per square (100 square feet). It adheres to damp or dry, flat or vertical surfaces and clings as tightly to brick, masonry, metal, or wood as it does to composition roofing.

Owens - Corning Fiberglas Corp., Toledo 1.

■

Protective Coatings

Thermo-plastic, light-fast, resin-based coatings—formulated in white, aluminum, and clear—give your gasoline, solvent, oil, and chemical installations superior chemical and weathering resistance, makers claim. Called Lankote 300 Series, coatings can be easily brushed or sprayed and have high gloss retention and brilliance. Two coats, applied in an 8-hr. day, are sufficient for most jobs.

Lankote Div., J. Landau Co., 221 Wooster St., New York 12.

Turn the page

Meet your B-RIGHT-ON *dealer*

Just as you must know your customers' needs . . . he knows yours. He really understands . . . as does every Brighton franchise holder . . . the uses and applications of socket screws . . . and is ready at any time to advise you.

One of his most important functions is to give you prompt service. He's johnny-on-the-spot . . . filling your order from his adequate stock, backed up by centrally located Brighton factory stocks.

He's proud of Brighton Screws . . . they're a real quality line . . . meeting all of your requirements, including the highest standards of strength, accuracy and uniformity.

Make your Brighton dealer a member of your production team . . . get his help on *any* socket screw question. If you're not already acquainted . . . write for his name.

- Socket Set Screws
- Socket Cap Screws
- Socket Head Stripper Bolts
- Socket Pipe Plugs

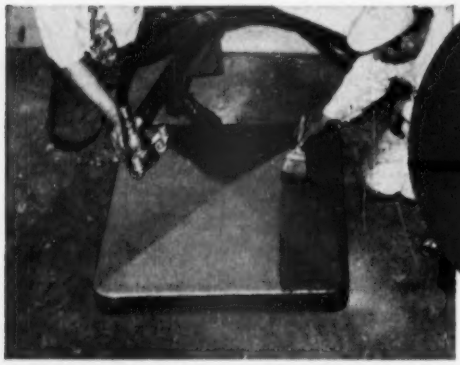
THE BRIGHTON SCREW & MANUFACTURING CO.

QUALITY B-RIGHT-ON PRODUCTS ®

Reading Road opposite Deer Creek
Cincinnati 2, Ohio

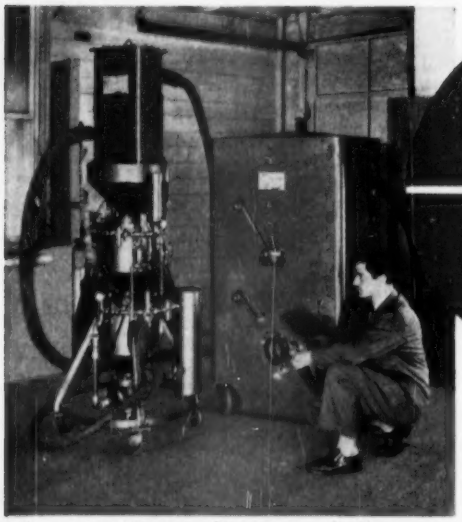
BLAST CLEANING
WITHOUT DUST OR GRIT

VACU-BLAST scours the surface, eats the dust and reclaims the abrasive — all at once!

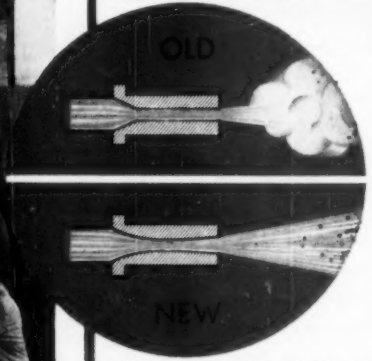


Right in the midst of your working shop, Vacu-Blast removes rust, paint and scale from metal, masonry and wood with a thoroughness and efficiency that only abrasive blasting provides. Surfaces are perfectly prepared for welding, painting or process requirements, yet there's no dust or scattered abrasive to interfere with other operations.

The abrasive, dust and debris are confined within the blast gun — they are picked up by Vacu-Blast's unique, patented vacuum return. The blasted surface is left clean and dustless. Your shop is protected from the nuisance of scattered dust and grit. Valuable abrasive is reused numerous times.



This is Vacu-Blast's working team — the blast gun — the combination generator/reclaimer, and the dust collector. All are compact, portable and easy to move around.



Newest Vacu-Blast improvement is the flared, high efficiency nozzle that does up to 25% more work per hour than previous nozzles. Developed through extensive research, the throat design of this new nozzle eliminates inefficient shock waves, resulting in full power flow of abrasive. This new nozzle is now provided on all Vacu-Blast equipment, and has been made available to all present users.

VACU-BLAST CO. INC.

268 PENINSULA AVENUE, SAN MATEO, CALIF.

Please send specific detail information applying to the _____ business.

Firm _____

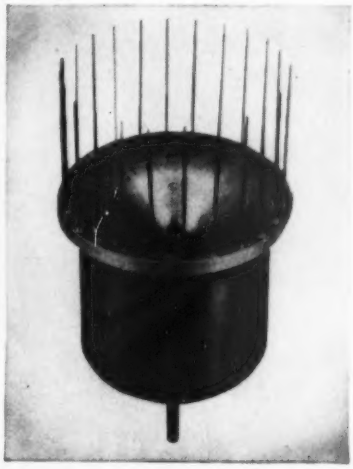
Address _____

Signed _____

Write for free booklet

NEW MAINTENANCE TOOLS & SUPPLIES

Begins on page 180



Automatic Control for De-Icing Equipment

Your yard operations will never be put "on ice" if you have this weather-sensing unit watching over them.

Called "Snow Detector," it turns on heating elements in your rail switches and snow removal system whenever icing conditions exist, then turns them off when icing hazard has passed.

Mounted at a suitable outdoor point, unit detects precipitation when ambient temperature drops below 37F., the normal borderline temperature for snow. No power is consumed by detector or by heaters at higher temperatures. And up to 30 amperes at 117 volts a-c can be switched on without external relays. Unit diameter is 7¼ inches. Vertical rods along edge prevent birds from nesting in bowl.

Motorola, 4545 W. Augusta Blvd., Chicago 51.

■

POCKET-SIZE BOLT AND NUT GAGE, made of durable plastic, is a useful, convenient tool for your maintenance men. Nuts are quickly measured by dropping them on posts along top of gage. Sorrell Mfg. Co., 15017 Detroit Ave., Lakewood 7, Ill.

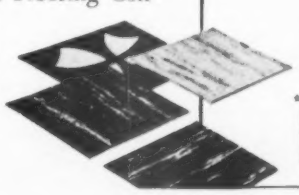
Turn the page

What can the company president learn from mopping the floor?

HE'D LEARN that even floors that look alike can be vastly different . . . in their ability to withstand dirt, stain and wear.

He'd quickly find out that a floor well suited for his office would be a poor choice . . . *a waste of money* . . . in the staff's basement locker room or the cafeteria.

And, he'd learn to call on the expert services and trained knowledge of the Kentile Flooring Contractor . . . a man fully qualified to survey his flooring needs and recommend the one floor that is best . . . most economical . . . for every installation.



Call the Kentile Flooring Contractor* for up-to-date information about these floors

- ✓ KENTILE ASPHALT TILE
- ✓ KENRUBBER TILE FLOORS
- ✓ KENCORK FLOORS & WALLS
- ✓ SPECIAL greaseproof KENTILE

KENTILE INC.

*If you don't know the name of your Kentile Flooring Contractor look under FLOORS in your Classified Phone Directory or write Contract Dept., Kentile, Inc., 58 2nd Ave., Brooklyn 15, N. Y.

1069 standard products to solve your finishing problems!

Whether you need help in applying special finishes or coatings to military items or glistening finishes to civilian products...whether you want to spray tar-like sound deadeners or light coats of paint... whether you want to finish automatically at high speed or just do occasional maintenance painting ...in short, *no matter what* your finishing problem, you can get all the spraying equipment you need from *1 source*, Binks.

Moreover, Binks complete line of spray painting equipment saves you time and money because each item is *standard*. If you want special help in selecting or using Binks products, Binks Engineering Department is at your service, without obligation. Send in coupon or write Binks Manufacturing Co., 3114-34 W. Carroll Ave., Chicago 12, Illinois, for full information.

Learn how to slash finishing costs! Mail coupon now!

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EVERYTHING FOR SPRAY PAINTING

Binks Manufacturing Company, 3114-34 W. Carroll Ave., Chicago 12.

Gentlemen: Please rush me my FREE copy of your CATALOG-DATA BOOK NO. 955 containing product descriptions indicating how Binks equipment can help me.

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REPRESENTATIVES IN PRINCIPAL U. S. & CANADIAN CITIES · SEE YOUR CLASSIFIED PHONE DIRECTORY

WHAT'S NEW IN EQUIPMENT

Begins on page 158

MEASURING & CONTROL

A-C to D-C Regulated Selenium Rectifier

The new "Magnivolt" unit uses a magnetic amplifier that contains no moving parts or vacuum tubes. And it requires virtually no maintenance or replacement of parts, according to manufacturer.

"Magnivolt" gives you better than 1% regulation from no load to full load, with ±10% a-c line variation.

Inert, Inc., 8655 S. Main St., Los Angeles 3.

■

Stainless Steel Industrial Meter

The 2 BC Rotocycle stainless steel rotary displacement meter can handle a maximum capacity of 100 gallons per minute of corrosive liquids at a working pressure of 125 pounds per square inch.

And you can get unit with provisions for remote registration by electrical impulse, quantity control by built-in electric switch that is actuated after predetermined volume of liquid has passed through, and swivel and angle adapters.

Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8.

Turn the page

Order-assembly area at Johnson & Johnson, Chicago. Alternate order-picking aisles are reserved for one-way, two-lane TRUCK-TOW traffic. Fork-lift trucks use other aisles for replenishing stock. Trucks are switched automatically from two-lane traffic to single lane traffic at point A.

Link-Belt TRUCK-TOW helps cut order-assembly manhours 70%!

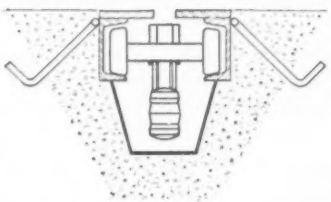
Johnson & Johnson sets new records for speed, safety, efficiency

BY LIMITING manual carrying of merchandise to less than three feet, eliminating confusing cross-traffic, Johnson & Johnson has achieved spectacular savings in its new Chicago shipping center. With the help of two parallel, integrated Link-Belt TRUCK-TOW Conveyors, they have actually *reduced manhours for order-picking by 70%* . . . for overall shipping operations by 35%.

Two parallel conveyor lines through order-picking aisles permit passing and practically double capacity. One line of trucks may be delegated for "slow" picking without hindering trucks on adjacent lane. Special towing masts permit automatic disengagement of truck to suit position of stock pickers. Hinged safety bumpers automatically disengage trucks when obstructed. Steel enclosures around track, trolleys and chain contribute to plant cleanliness.

Many other plants, warehouses and terminals report that TRUCK-TOW offers welcomed savings—not only for order-picking and shipping operations, but for receiving, department-to-department transport and in and out of storage. Whether you need a simple system or one tailored to suit special conditions . . . whenever packaged or bulky items are moved along a regular route, Link-Belt TRUCK-TOW Conveyors can slash your handling costs.

FLOOR TYPE TRUCK-TOW CONVEYOR OFFERS ADVANCED-DESIGN FEATURES

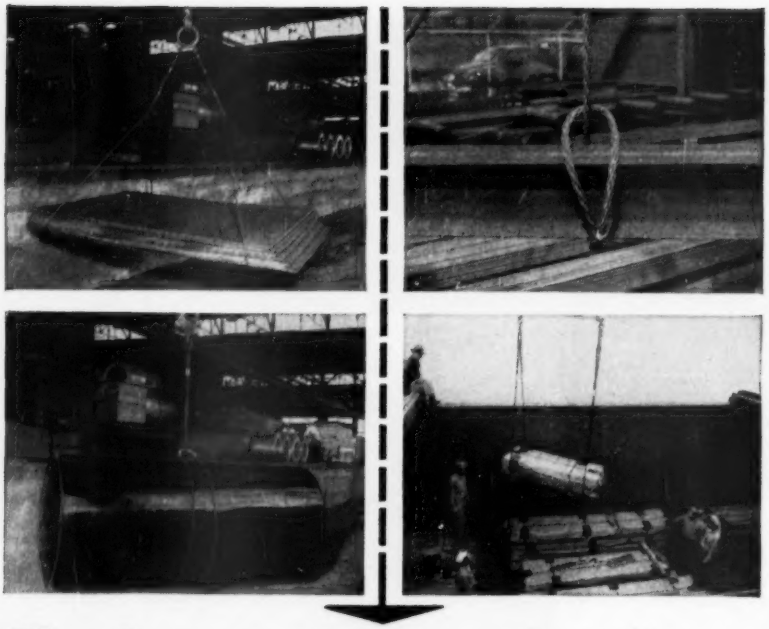


Especially popular where overhead structures interfere with fork-lift truck operation is the Floor-Type TRUCK-TOW. All moving parts are located below the floor.

LINK-BELT

TRUCK-TOW CONVEYORS

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices in Principal Cities. 12,777

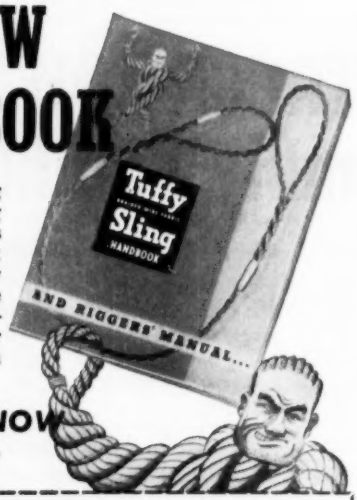


The Answers To Your Questions:

1 How to determine the sling types you need
2 How to get longer sling life
3 How to make hitching and unhitching easier
4 Proved ways to cut sling costs
5 How to splice wire rope — directions for socketing

IN THIS NEW SLING HANDBOOK

Only handbook of its kind in the sling field—packed with useful, money-saving facts that can help you cut sling costs up to 40%. The Tuffy Sling Handbook and Rigger's Manual shows you how Tuffy's exclusive, patented braided wire fabric construction assures greater flexibility and longer service life. See for yourself how much you can save with Tuffy Slings on the job!



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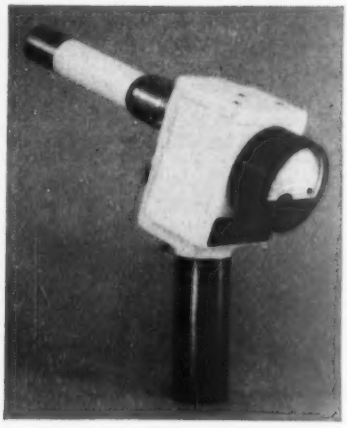
Firm Name_____

By_____ Title_____

Address_____ City_____ State_____

MEASURING & CONTROL EQUIPMENT

Begins on page 188



Detects and Measures Electrostatic Charges

You aim Statigun and pull the trigger switch. The voltage on the surface at which the instrument is pointed is given by multiplying the scale reading by the sensitivity factor and the distance in feet between the object and the instrument.

Statigun measures electrostatic charges accurately and safely—gives you a ready method of eliminating conditions and finding the causes that lead to electrostatic changes and the resulting explosion hazards.

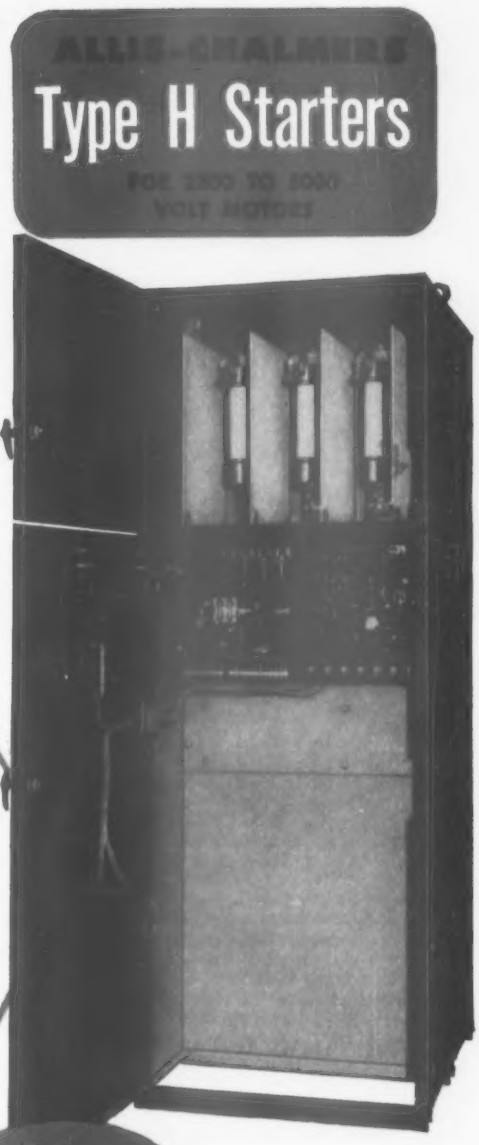
Herman H. Sticht Co., Inc., 27 Park Place, New York 7.

■

AUTOMATICALLY CONTROLLED VARIABLE SPEED DRIVES, combining Conoflow controls with all integral horsepower Reeves Vari-Speed Motodrives, are announced by Reeves Pulley Co., Columbus, Ind., for use with instrumentation air pressures of 3 to 15 pounds per square inch. Conoflow Controls also permit Motodrives to control liquid levels in open or enclosed tanks and to control flow-proportioning systems of liquid, gas, chemicals, grain, etc., as well as pressure and temperature.

Turn the page

Complete Control and Protection for Your Motors



ONE ATTRACTIVE easy-to-install steel cabinet is all you need between line and motor when you specify Allis-Chalmers Type H Starters. Contactors, protective devices, meters, relays . . . everything you need for complete control and protection of your motors is built into Type H Starters. You get:

1 Short Circuit Protection . . . provided by current limiting fuses that are easily accessible.

2 Overload Protection . . . Thermal relays have compensating elements — automatically adjust for ambient temperatures — trip on motor overload only.

3 Safe, Accessible Cubicle . . . upper front compartment encloses disconnect type fuses; lower front compartment, the low voltage control devices; rear compartment, the high voltage equipment.

4 Easy Installation . . . single steel enclosure is easy to handle, internal wiring is complete, wiring terminals accessible, easy to connect.

5 Personnel Protection . . . high voltage fuse compartment has electrical interlock.

6 Meters, Push Buttons, Recording Instruments, Rheostats, and similar devices you may need are mounted on the door of the low voltage compartment.

Other features include undervoltage protection . . . and your choice of either air break or oil immersed contactors — whichever is best for your application.

For motor control that is engineered to your job, specify Allis-Chalmers Type H Starters for motors with ratings up to 2500 hp. Call your nearby A-C representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin for bulletin 14B6410A.

Specify Type 256 Air Break Contactor, shown, for tough, repetitive duty, longer contact life . . . Type MO Oil Immersed Contactor for normal starting duty or for service in dust laden, corrosive or very moist atmospheres.

A-3350

ALLIS-CHALMERS

1 man does the work of 5

with a **TENNANT POWER SWEEPER**

PAYS FOR ITSELF. In a plant like this a Tennant Power Sweeper easily pays for itself in about 4 to 12 months.

Put just 1 man on a TENNANT Power Sweeper and he'll usually sweep *more* than a 5-man crew . . . do a cleaner job . . . and cause less disturbance in your busy aisles.

This fast, labor-saving performance is reported by hundreds of plants in many industries. And it's made possible by *EXCLUSIVE engineering features* . . . things that make it extra-easy for 1 man to replace a 5-man sweeping crew—or more.

NEW FEATURES SAVE TIME

REVERSES INSTANTLY. Saves time; no hand shifting of gears. Single pedal controls forward and reverse.

TURNS "ON A DIME." Lets you get in and out of tight corners in fraction of usual time. Extra-easy to steer and control. Rear wheel automotive steering.

SWEEPS FAST; EXTRA CLEAN. Has maximum capacity exceeding 90,000 sq. ft. per hour. Powerful vacuum-brush system even gets dirt from many cracks, crevices.

FOR CLEAN, LOW-COST SWEEPING where battery power is desired, here's the Tennant Model 36 Electric Sweeper.
It's NEW . . . does the work of a 3 to 8 man crew . . . sweeps full shift on one charge (36 v. battery). *Ask for bulletin.*

FREE!

An accurate estimate of savings your plant can make

It's yours for the asking—an accurate graph of your present sweeping costs . . . and how much you may save each month with a Tennant Power Sweeper.

Shows how soon a sweeper *pays for itself.* Get this graph today. No cost or obligation.

Write Today! Learn how much YOU can save with a Tennant Sweeper.

TENNANT Established 1870

G. H. Tennant Co.
2354 N. 2nd. ST.
Minneapolis 11,
Minnesota

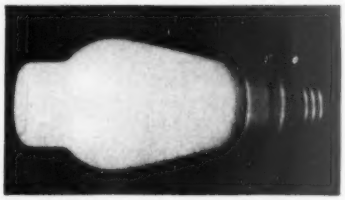
INDUSTRIAL FLOOR MACHINES

CREATORS OF THE TENNANT SYSTEM OF FLOOR MAINTENANCE—MANUFACTURERS OF EQUIPMENT AND MATERIALS FOR MAINTENANCE OF FLOORS, DECKS, ROOFS, HIGHWAYS

Offices in Principal Cities

Begins on page 158

PLANT HOUSEKEEPING & SANITATION



Insect Exterminator Lamp

You simply screw lamp into an ordinary light socket and drop a couple of Lindane pellets into a depression in the base. Lindane evaporates at the rate of 1 gram in 24 hours to kill flying and crawling insects within a 15,000-cu. ft. area with vapor that is practically odorless and harmless to humans.

Lamp is 6 inches high and is as economical as a regular 25-watt bulb. Gives you 24-hour protection without fumes or spraying. Doubles as a night light, too.

Solar Electric Corp., Warren, Pa.

■

Industrial Incinerator

You can save trash and garbage disposal costs with a Wincinator C-20. Unit burns up to 400 pounds per hour of wet and dry refuse. No brickwork or other masonry needed to install.

Any maintenance man or handy man can install a Wincinator in less than a day indoors or outdoors, wherever it can be vented to a flue or chimney. Twin burners use natural, manufactured, or bottled gas, electricity, or oil.

Winnen Incinerator Co., Bedford, Ohio.

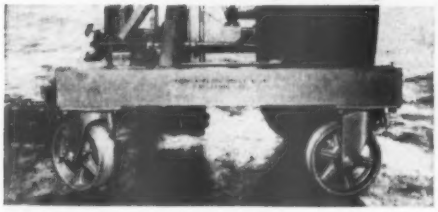
Turn the page

MATERIALS-HANDLING NEWS

★ Panel Discussions by Bassick, World's Largest Manufacturer of Casters and Floor Protection Equipment ★

Casters Equipped With These Conveniences Make Materials-Handling Easier, More Economical

Plunger-type Lock Prevents Swivel From Operating

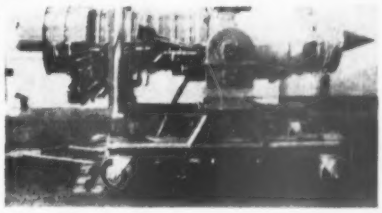


Sometimes it's desirable to keep a caster from swiveling. For such applications, there are many standard Bassick Casters which can be supplied with the easily operated plunger-type Swivel Lock. Complete flexibility in handling operations, for close quarters or long hauls.

Locking Is Sure With This Wheel Brake

In some kinds of materials-handling operations, a simple mechanism is needed to keep a wheel from turning. There's no substitute for the sure-holding action of Bassick's hand-operated Side Wing Brake.

Exclusive Sprung-Wheel "Floating-Hub" Absorbs Materials-Handling Shocks



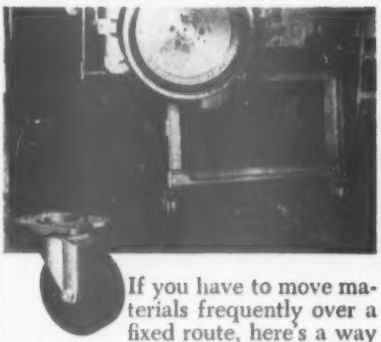
Loads are more safely and easily moved over rough surfaces when carried in equipment rolling on Bassick "Floating-Hub" Casters.

This patented construction actually "floats" a spring-controlled caster wheel in the frame, providing mechanical resiliency between rim and axle. Even over bumps, all wheels keep in contact with the floor. Hence, load distribution is always even. That's why Bassick's "Floating-Hub" means sure protection for highly-finished auto bumpers, ceramic products, glass and china ware, loose loads of small precision parts and innumerable fragile loads.

Hold Portable Equipment In Fixed Position With This Position Lock

Install Bassick Position Locks on portable equipment, and you can hold it in position with an easy, downward press of the lock's foot lever. This action places almost 12 sq. in. of friction locking surface in contact with the floor. A slight upward pressure under the lock's lever releases it.

Boost Materials-Handling Efficiency With Grooved Wheels on Angle Track



If you have to move materials frequently over a fixed route, here's a way to do it faster and more economically.

Equip trucks and dollies with Bassick Grooved-Wheel Casters and move them on inverted angle iron track. By doing so, you control movement along the route with production-line efficiency, and also make movement three times easier than flat wheels in direct contact with the floor.

Angle iron track is easily installed, inexpensive, self-cleaning. Bassick Grooved-Wheel Casters operate on the track or in direct contact with the floor.

They come in 4, 6, 8, 10 in. sizes, swivel or rigid.

Write for full details — no obligation

Write us for full data on any of the products discussed here, or information on any Bassick Caster. Bassick makes the world's largest line with the sizes and types for everything you wish to move easily, quietly, efficiently. Consult your local Bassick industrial distributor for expert advice, backed by our factory engineering assistance when needed.

THE BASSICK COMPANY
Bridgeport 2, Conn.
In Canada:
Belleville, Ont.

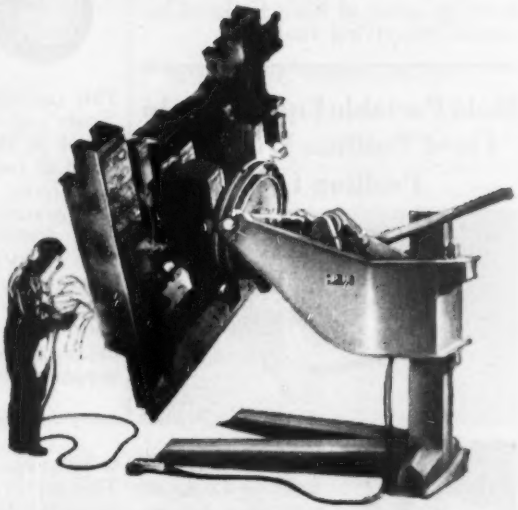
Bassick
A DIVISION OF
STEWART SW WARNER
MAKING MORE KINDS OF CASTERS... MAKING CASTERS DO MORE

One finger is enough

to position heavy workpieces for fast, economical downhand welding

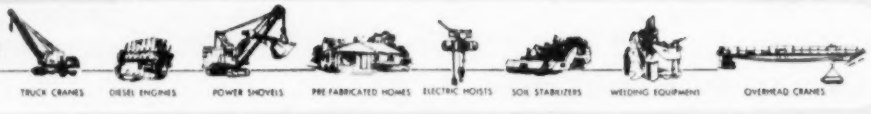
- with P&H positioners

Cut costs as much as 50% — position the weldment, not the operator! A touch of a control button does the work — saves handling time. Welding is downhand — permits using a larger rod for faster deposition. Welds are smooth, uniform. P&H Positioners are available in capacities from 2500 to 36,000 lbs. — remote-control and hand-operated models. Ask your P&H representative or distributor for further information — or write us.



P&H WELDING DIVISION
HARNISCHFEGER CORPORATION
4525 WEST NATIONAL AVENUE • MILWAUKEE 46, WISCONSIN

the P&H Line



Begins on page 158

SAFETY & PLANT PROTECTION

Compact Transmitter

The Handie Micro-Talkie transmits up to 5 miles in the 152-174-mc. frequency band. Unit weighs 1 pound 13 ounces and has a power output of 20 to 40 milliwatts from self-contained A and B batteries.

To transmit, you just press button on side and talk into microphone. Micro-Talkie is especially useful for watchmen or guards, freight car checking, inventory control, and materials handling.

Motorola, 4545 W. Augusta Blvd., Chicago 51.

■

Explosive-Gas Alarm

Consists of weather-resistant detector (right) and control box mounted at remote location. Operating by diffusion and convection, the flashback-proof detector senses the presence of combustible gas. At 0.2 of the lower explosive level, a red light flashes on control box.

Operates from standard 115-volt lines. Features an all-electronic alarm circuit that has no meters, meter-type relays, or other delicate mechanisms.

Johnson-Williams, Ltd., 2634 Third St., Palo Alto, Calif.

■

Safety Switch for Drills

You must insert chuck key in the Tricop safety switch to complete electrical circuit and make your drilling machine operative. Eliminates accidents while you're using chuck key to change drills. Keeps key handy, too.

Tricop Distributing Co., 308 W. Center St., Akron 2.

■

FLAME FAILURE PROTECTION, for gas, oil, pulverized coal, or combination fuel burners is provided by the Firetron 48PT1 scanner. A tiny photoconductive cell distinguishes between infrared of flame and infrared from other sources. When flame fails, scanner immediately shuts down burner to prevent explosion hazard. A single scanner keeps an eye on pilot and main flames. It replaces both flame rod and photocell detectors. Combustion Control Corp., 720 Beacon St., Boston 15.

■

VISUAL WARNING SIGNALS, called Gyralites, project high-intensity colored or clear beams that rotate with a wide, sweeping action to command immediate attention to points of danger. Especially useful in areas with high noise level where sound signals might not be heard. Pyle-National Co., 1334 N. Kostner Ave., Chicago 51.

Turn the page

P&H

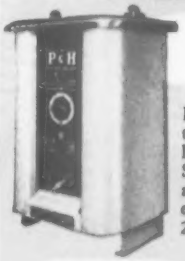
Arc Welders and Electrodes

put welding in your plant on a low-cost, high-production basis

P&H DC RECTIFIER WELDER

Has Dial-lectric Control for instantaneous heat selection at the work. Three sizes, 200, 300, and 500 amps., NEMA rated.

P&H WELDING TWINS



P&H AC WELDER

Has P&H Dial-lectric Instantaneous Remote Control. Sizes up to 625 amps., NEMA rated. Connectable to 220 and 440 volts.

P&H WN-301 Engine-Driven DC ARC WELDER

Portable. Equipped with Dial-lectric Control. Runs at only 1750 rpm. Welding service range, 60-375 amps., NEMA rated.

P&H LOW-HYDROGEN ELECTRODES

15 types that take the problem out of welding high-sulfur, free-machining, low-alloy, and high-strength steels; castings, etc.

Ask your P&H representative or distributor for complete information, or write for free bulletins.

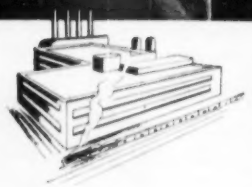
P&H WELDING DIVISION

HARNISCHFEGER CORPORATION

4525 W. National Ave., Milwaukee 46, Wis.

How
AMERICA
out-produces
the world
Logan Roller Conveyor provides a constant supply of airplane engine cylinder barrels for this battery of internal grinding machines.

5



American industry — keeps expensive equipment operating at capacity

Another good American industrial habit — stepping-up the hourly output of machines! This means greater production, and lower-costs too.

One of the chief factors in "keeping machines busy" is equipment like Logan Conveyors. By delivering a stream of material and parts to machine operators, and dispatching the product to the next operation, Logan equipment aids in attaining the high American output per machine-hour.

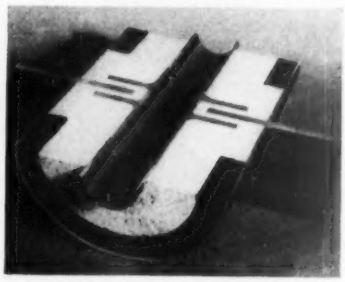
And remember, the name "Logan" on the installation you buy is your assurance of something extra in engineering, design, and layout. Write today to —

Logan Conveyors

LOGAN CO., 510 CABEL ST., LOUISVILLE, KY.

Begins on page 158

VALVES & FITTINGS

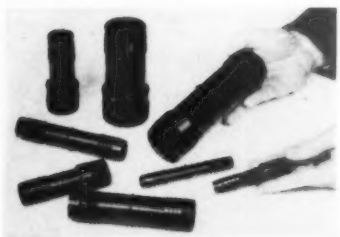


Insulated Anchor for Undeground Piping

This anchor is insulated from pipeline both thermally and electrically by a non-compressible block of Transite sheet material. Minimizes heat loss at anchor points in your underground pipe systems carrying hot or cold liquids or gases. Also prevents corrosion due to electrolytic action.

Durant Insulated Pipe Co., Bay Rd., Palo Alto, Calif.

■

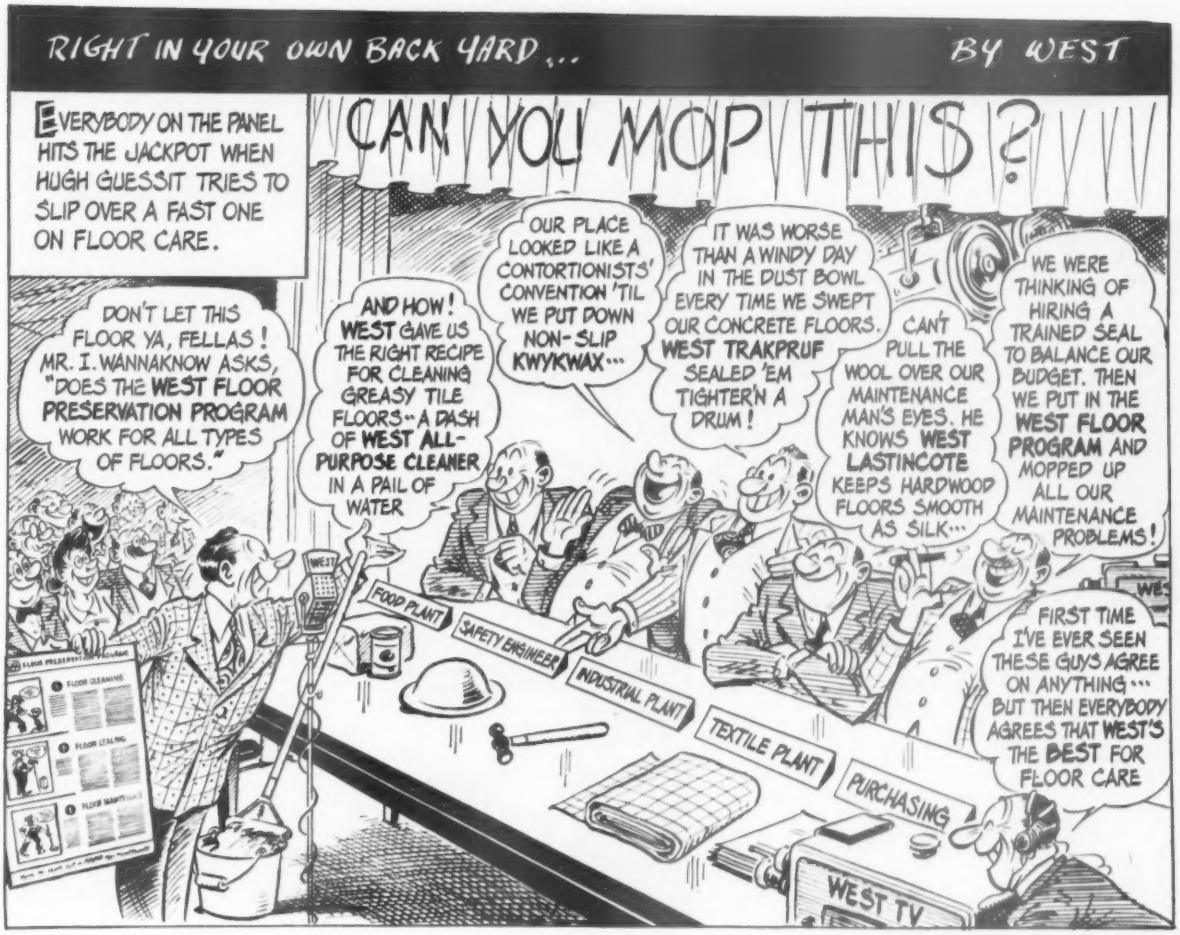


Styrene Plastic Couplings and Adaptors

Ranging from ½ to 2 inches in diameter, these fittings are designed for use with flexible plastic pipes having inside diameter equivalent to those of standard iron pipe.

Monsanto Chemical Co., Springfield, Mass.

Turn the page


RIGHT IN YOUR OWN BACK YARD... BY WEST
EVERYBODY ON THE PANEL HITS THE JACKPOT WHEN HUGH GUESSIT TRIES TO SLIP OVER A FAST ONE ON FLOOR CARE.
CAN YOU MOP THIS?
DON'T LET THIS FLOOR YA, FELLAS! MR. I. WANNAKNOW ASKS, "DOES THE WEST FLOOR PRESERVATION PROGRAM WORK FOR ALL TYPES OF FLOORS."
AND HOW! WEST GAVE US THE RIGHT RECIPE FOR CLEANING GREASY TILE FLOORS--A DASH OF WEST ALL-PURPOSE CLEANER IN A PAIL OF WATER
OUR PLACE LOOKED LIKE A CONTORTIONISTS' CONVENTION 'TIL WE PUT DOWN NON-SLIP KWYKWAX...
IT WAS WORSE THAN A WINDY DAY IN THE DUST BOWL EVERY TIME WE SWEPT OUR CONCRETE FLOORS. WEST TRAKPRUF SEALED 'EM TIGHTER'N A DRUM!
CAN'T PULL THE WOOL OVER OUR MAINTENANCE MAN'S EYES. HE KNOWS WEST LASTINCOTE KEEPS HARDWOOD FLOORS SMOOTH AS SILK...
WE WERE THINKING OF HIRING A TRAINED SEAL TO BALANCE OUR BUDGET. THEN WE PUT IN THE WEST FLOOR PROGRAM AND MOPPED UP ALL OUR MAINTENANCE PROBLEMS!
FIRST TIME I'VE EVER SEEN THESE GUYS AGREE ON ANYTHING... BUT THEN EVERYBODY AGREES THAT WEST'S THE BEST FOR FLOOR CARE
FOOD PLANT
SAFETY ENGINEER
INDUSTRIAL PLANT
TEXTILE PLANT
PURCHASING
WEST TV

New floors cost $300,000,000 *a year!*

TYPE OF FLOOR	INSTALLED COST* OF 50,000 SQ. FT.
Asphalt Tile	$15,000
Concrete	18,000
Linoleum	21,000
Hardwood	27,500
Cork	39,000
Rubber Tile	44,000
Vinyl Tile	44,000
Ceramic Tile	65,000
Terrazzo & Mosaic	87,500
Marble	300,000

*Based on reports of reliable flooring contractors in urban areas.

How much will it cost you to replace worn-out floors today? The chart gives you some idea.

But, your floors *don't have* to wear out. They can be protected almost indefinitely.

How? With West's simple, proven FLOOR PRESERVATION PLAN. (1) *Cleaning* — remove all dirt without harming floors (2) *Sealing* — fill the pores. Provide a protective coating (3) *Maintaining* — put on a tough, anti-slip floor wax.

The West Plan offers you more than 20 proven products. A West Floor Specialist will be glad to help you select the program or product you need.

WEST DISINFECTING Company

42-16 West Street, Long Island City 1, N. Y.

Visit us at the PLANT MAINTENANCE SHOW — CLEVELAND Jan. 19-22 Booth #501

Please send FREE booklet "Proper Care of Floors"

DEPT. 56

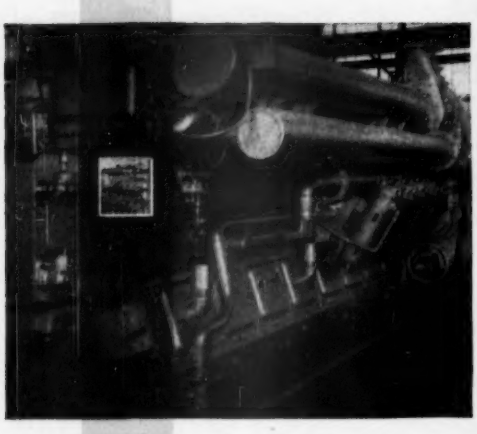
Name_____ Title_____

Company_____

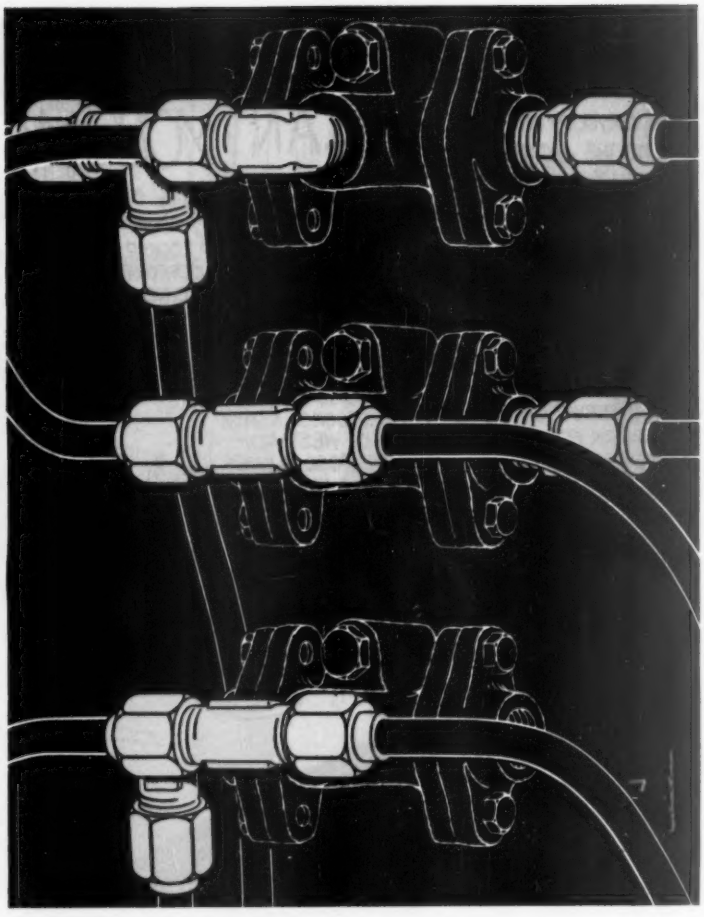
Address_____

City_____ Zone____ State_____

ON DIESEL ENGINES



This typical Diesel engine manufactured by The National Supply Company, Engine Division, Springfield, is equipped with Parker Triple-lok Fittings.



Tube it up...Forget it ...WITH PARKER

TROUBLE-FREE TRIPLE-LOK FITTINGS

Diesel service is rugged. Constant vibration puts a severe strain on all engine parts, including fittings connecting fluid handling lines. Yet no leak, however small, can be tolerated.

That's why so many Diesel engine manufacturers rely on Parker Triple-lok Fittings . . . the fitting that meets specifications of the A.S.M.E. Code for Pressure Piping, and J.I.C. and S.A.E. standards. They are leakproof under severest conditions of vibration, elevated temperatures, high pressures and repeated assembly.

So *tube it up* and *forget it* . . . with Parker Triple-lok Fittings. Ask your Parker Distributor for Tube Fitting Catalog 4300, or write The PARKER Appliance Company, 17325 Euclid Ave., Cleveland 12, O.

This does it

Triple-lok . . . 3-piece flare fitting famous for its sleeve . . . the easiest way to install tubing systems. Made in brass, steel, stainless steel, aluminum alloy.

Precision Mark of

Leakproof Tube Fittings

Parker

TUBE FITTINGS • VALVES • O-RINGS

Plants in Cleveland • Los Angeles • Eaton, Ohio • Berea, Ky.

Parker

INDUSTRIAL TUBE FITTING

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AKRON, O.	B. W. Rogers Co. 850 So. High St. (9)
BALTIMORE, Md.	Carey Machinery & Supply Co. 3501 Brehms Lane (13) Whitehead Metal Products Co. 4300 E. Monument St. (5)
BEAUMONT, Tex.	Standard Brass & Mfg. Co. 705 Milam St.
BOSTON, Mass.	A. E. Borden Co., Inc. 176 Brookline Ave. (15)
BRYSON CITY, N. C.	Wallace Co. of Carolina P.O. Box 572
BUFFALO, N. Y.	Whitehead Metal Products Co. 2128 Elmwood Ave. (17)
CAMBRIDGE, Mass.	Whitehead Metal Products Co. 281 Albany St. (39)
CEDAR RAPIDS, Ia.	Globe Machinery & Supply Co. 309 8th Ave., S.E.
CHICAGO, Ill.	Wallace Tube Co. 1300 Diversey Parkway (14)
CINCINNATI, O.	Williams & Co. 3231 Fredonia Ave. (29)
CLEVELAND, O.	W. M. Pattison Supply Co. 777 Rockwell Ave. (14) B. W. Rogers Co. 1900 Euclid Ave. (15) Williams & Co. 3700 Perkins Ave. (14)
COLUMBUS, O.	Williams & Co. 851 Williams Ave. (8)
DALLAS, Tex.	Metal Goods Corp. 6211 Cedar Springs Rd. (9)
DAVENPORT, Ia.	Globe Machinery & Supply Co. 410 East Second St.
DAYTON, O.	J. N. Fauver Co. 1534 Keystone Ave. (10)
DENVER, Colo.	Metal Goods Corp. 2425 Walnut St. (2)
DES MOINES, Ia.	Globe Machinery & Supply Co. East First & Court Ave. (6)
DETROIT, Mich.	J. N. Fauver Co. 49 West Hancock St. (1)
HARRISON, N. J.	Whitehead Metal Products Co. 1000 South Fourth Ave.
HOUSTON, Tex.	Metal Goods Corp. 711 Milby St. (3) Standard Brass & Mfg. Co. 2018 Franklin St. (1)
INDIANAPOLIS, Ind.	Karbumet Steel & Aluminum Co. 1916 N. Meridian St. (2)
KANSAS CITY, Mo.	Metal Goods Corp. 1300 Burlington Ave. North Kansas City (16)
KNOXVILLE, Tenn.	Leinart Engineering Co. 412 E. 5th Ave. (5)
LOS ANGELES, Cal.	Haskel Engineering & Sup. Co. 721 W. Broadway, Glendale (4) Metropolitan Supply Co. 353 East 2nd St. (12)
MEMPHIS, Tenn.	J. E. Dilworth Co. 730 South Third St.
MILWAUKEE, Wis.	Marman Belting & Supply Co. 522 W. State St. (3) Wallace Co. of Wisconsin 838 So. 6th St. (4)
MINNEAPOLIS, Minn.	Vincent Brass & Copper Co. 124 Twelfth Ave., So. (15)
NEW ORLEANS, La.	Metal Goods Corp. 432 Julia St. (13)
NEWPORT NEWS, Va.	Noland Company 27th St. & Virginia Ave.
NEW YORK, N. Y.	Nielsen Hydraulic Equipment Inc. 298 Lafayette St. (12) Whitehead Metal Products Co. 303 West 10th St. (14)
PHILADELPHIA, Pa.	Louis H. Hein Co. 15 West Lancaster Ave. Ardmore, Pa. Whitehead Metal Products Co. 1955 Hunting Park Ave. (40)
PITTSBURGH, Pa.	Williams & Co. 901 Pennsylvania Ave. (33)
PORTLAND, Ore.	Hydraulic Power Equipment Co. 2316 N. W. Savier St. (10)
ROANOKE, Va.	Noland Company 11 Salem Ave. (10)
ROCKFORD, Ill.	Rockford Tool & Transmission Co. 802 Broadway
SAN FRANCISCO, Cal.	General Machinery & Sup. Co. 1346 Folsom St. (3)
SEATTLE, Wash.	Palmer Supply Co. 222 Westlake Ave., North (9)
ST. LOUIS, Mo.	Metal Goods Corp. 5239 Brown Ave. (15)
SYRACUSE, N. Y.	Whitehead Metal Products Co. 207 West Taylor St. (14)
TOLEDO, O.	Williams & Co. 650 E. Woodruff Ave. (2)
TULSA, Okla.	Ardun Supply Co. 317 S. Detroit Metal Goods Corp. 302 North Boston (3)
CANADA	Railway & Power Engineering Corp. Ltd.
EXPORT	Mercator Corp. 438 Walnut St. Reading, Pa.

VALVES & FITTINGS

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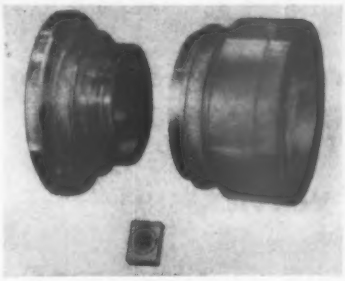

Quick-Connect Pipe Coupler

You can make or break connection by merely sliding a sleeve on coupler—no tools are needed. Coupler has standard flanged connections. Valve in coupler body automatically shuts off liquid flow when male part is removed.

Available for ¼- to 8-in. pipe lines. Sizes up to 3 inches are designed for screwed fittings, male or female. Sizes over 3 inches are for screwed or flanged fittings. All couplers swivel 360 degrees, eliminating hose kinks.

Snap-Tite, Inc., Union City, Pa.

■

PNEUMATIC AND HYDRAULIC VALVES in ⅛- and ¼-in. NPT sizes are offered by Versa Products Co., Inc., 249 Scholes St., Brooklyn. Selection includes 2-, 3-, and 4-way types with a choice of hand, foot, pilot, or cam actuating devices with or without spring return. Internal parts of all models are interchangeable, and all valves can be completely serviced with a screwdriver.

■

3 - WAY SELENOID - CONTROLLED PILOT-OPERATED VALVE is announced by Barksdale Valves, 1566 E. Slauson Ave., Los Angeles 11. Called Model 1034, it is designed to control any light fluid medium such as air, water, and light oils. Provides pressure range from 20 to 500 psi.

Turn the page

WHERE TO BUY

Pipe Repair CLAMPS

Made for every type of leak—any temperature or pressure. Send for Catalog No. 41-0.
M. B. SKINNER CO., SOUTH BEND 21, INDIANA

STOP *that* WATER

With FORMULA NO. 640, a clear liquid which penetrates 1" plus in concrete, brick, stucco, plaster, etc. Seals out water, dirt. Holds 20' head. Use outside and in. Preserves all absorbent materials. Sold 14 years. Quick, economical, sure. $3 in 55's. Free sample. See Sweet's.
HAYNES PRODUCTS CO., OMAHA 3, NEBR.

STOP DUST

DUSTKOPS — UNIT TYPE, LOW COST
22 Models — 300 cfm to 10,000 cfm; ¼ hp to 15 hp

AVAILABLE FROM STOCK

For: Grinders, buffers, polishers, woodworking, lint . . . **ALL DUSTS**

Send for Cat. 605t; describe problem for recommendation by return mail, without obligation

AGET-DETROIT CO. • ANN ARBOR, MICH.

FLUX

for
SODERING
SILVER SODERING
WELDING
BRAZING

L. B. ALLEN CO., INC.
6781 BRYN MAWR AVE., CHICAGO 31, ILL.

TECH CLAMP Pat. Pending

A Quick Acting-Adjustable Holding Device

PORTABLE
RAPID SETTING
PRECISION FIXTURE

PRICE: $14.75 — F.O.B. BOSTON

TIME SAVER—Quick Clamping Action—Eliminates Slow Threading.
ECONOMICAL—Nominal Priced Tool Produced In Quantity.
CUTS COSTS—Portable Multi-Operation Holding Fixture.
HIGHER PRODUCTION—Fast Clamping Of Difficult Shapes With Variable Pressure Control.
Specifications—Weight: 10 lbs., Length 13½", Width: 3", Jaw Height: 1¾", Max. Jaw Opening 3¼", Machine Ground Top, Bottom & Holding Side Working Surfaces.

Mfd. by **TECH-CLAMP CO., Inc.**
177 State St., Boston 9, Mass.
Telephone: CApitol 7-1614

...Your Key to '53

MARK THE DATES

Be sure to see the latest in
AIR CONDITIONING
HEATING
VENTILATING

LARGEST SHOW of its kind ever held—11th Air Conditioning Exposition—will fill Chicago's huge International Amphitheatre from January 26-30, 1953.

LARGE IN SIZE—More than 300 exhibits—many of them larger than in previous years—will display the latest methods and equipment developed for conditioning air in all types of buildings, plants, and homes . . . hundreds of new, improved items, from complete units to parts.

LARGE IN OPPORTUNITY—Plant owners, managers, operators, architects, and engineers will have an unequalled opportunity to discuss plans, problems, and requirements with technical experts who will be staffing the exhibits . . . get practical solutions to current and future problems . . . make many new, valuable contacts . . . come away with a wealth of sound, cost-saving ideas, unavailable anywhere else in so little time.

Arrange *now* to ATTEND and BENEFIT from this unique exposition of IDEAS and PROGRESS.

INTERNATIONAL AMPHITHEATRE
CHICAGO
JAN. 26-30

11th Air Conditioning Exposition
INTERNATIONAL HEATING & VENTILATING EXPOSITION
Under Auspices of American Society of Heating & Ventilating Engineers
MANAGEMENT INTERNATIONAL EXPOSITION CO.

WHAT'S NEW IN EQUIPMENT
Begins on page 158

MISCELLANEOUS

Color-Labeled Abrasive Blades

The new Porter-Cable abrasive blades have color-keyed labels so you can pick the right one for the job at a glance. Red Label cuts compositions and non-ferrous metals, Green Label is for stone and plastic, and Blue Label cuts iron and steel.

Blades are available in 6-, 7-, and 8-in. diameters. They can be bought in a set with the new Speedmatic high-speed, kick-proof electric saw, or separately for use on any electric saw.

Porter-Cable Machine Co., Syracuse 8, N. Y.

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Non-Slip Work Gloves

You can grab and hold slippery objects with gloves coated with Vinylite resins. Gloves give you a handy assist when working with oils, greases, and lubricants. Vinylite resin coating produces rough surface with high gripping ability. Gloves are tough and have high abrasion resistance, yet remain flexible at low temperatures. Come in all styles, fully coated or with only palm coated.

Plasticote Glove Co., Inc., 102 W. Walnut St., Milwaukee 12.

Turn the page

DEPENDABLE!

DODGE SC
BALL BEARING
PILLOW BLOCK

EVEN AT LOW SPEEDS
THIS SEAL *PERFORMS!*

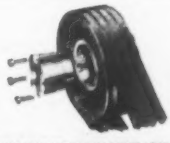
It's the famous Dodge metallic-backed neoprene seal that has proved itself in thousands of installations. It stays put. It can't blow. It keeps lubricant in—dust and dirt out—even at low speeds.

The SC Ball Bearing Pillow Block for small shafts and moderate loads, is a precision-built unit—a member of the famous Dodge 30,000-hour line. Modern styling . . . rugged one-piece semi-steel housing . . . long inner race . . . radial and thrust load capacity . . . fully self-aligning. Available from distributors' stocks in shaft sizes from $\frac{3}{4}$" to $2\frac{7}{16}$". Write for special bulletin giving complete specifications.

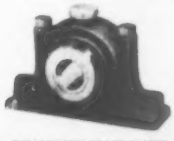
DODGE MANUFACTURING CORPORATION
400 UNION STREET, MISHAWAKA, INDIANA

DODGE
of Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new cost-saving methods. Look for his name under "Power Transmission Equipment" in your classified phone book.



SEALED-LIFE V-BELTS AND TAPER-LOCK SHEAVES



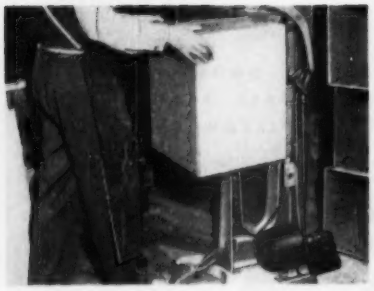
DODGE-TIMKEN PILLOW BLOCKS

ROLLING GRIP AND DIAMOND D FRICTION CLUTCHES

NAME PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY,
CHICAGO THRIFT-ETCHING CORPORATION, 1555 SHEFFIELD AVENUE, CHICAGO 22, ILLINOIS

BOSTITCH IN YOUR SHIPPING ROOM CRACKS DOWN ON RISING COSTS



Bostitch Box Bottom Stitchers and Staplers—Many different machines to fit your exact need—whether it's occasional box bottoming or high-speed, continuous production. There's no storage problem—you make up containers as needed.

Bostitch Top Stitchers and Staplers can handle heavily loaded boxes in a variety of sizes. Work table adjusts to container height by manual or automatic control. Combination box and bottom or top and bottom models also available.

Bostitch Autoclench—Just touch it to a corrugated container, press the lever and a strong steel stitch seals the spot securely. No need for a blade or anvil, the staple closes itself. Easy to operate. Easy to load. See it demonstrated by your local Bostitch man.

Bostitch Tackers and Stapling Hammers – Make quick work of tagging, labeling, and lining wooden boxes. Two to four times as fast as hammer-and-tacks. Special Bostitch T5 fastens tags to corrugated containers by clinching staples inside the board!

Write for free bulletin which shows how Bostitch shipping-room tools can save time and money for you. Mark and mail the coupon below.

BOSTITCH, 601 Mechanic Street, Westerly, R. I.

Please send me a free copy of your bulletin on Bostitch stapling machines for shipping-room use.

I am particularly interested in a better and faster method for:

☐ Assembling cartons ☐ Sealing corrugated wrappers ☐ Covering barrels
☐ Bottoming ☐ Repairing cartons for re-use ☐ Tagging
☐ Top-sealing ☐ Bag-sealing Other _____

Name _____

Company _____

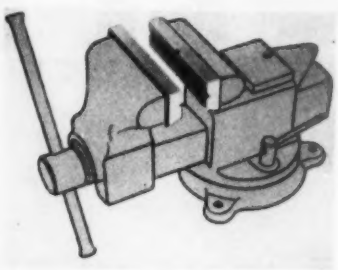
Address _____

City _____ *Zone* _____ *State* _____

BOSTITCH® fastens it better, AND FASTER, with wire

MISCELLANEOUS EQUIPMENT

Begins on page 200



Magnets Hold These Soft Vise Jaws

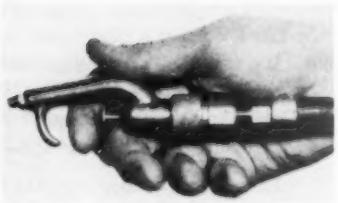
You just snap them on. Strong permanent magnets hold Magne-Grip soft jaws securely in place without springs, clips, or screws.

Jaws are made of an alloy that won't mar, scratch, or gouge delicate finishes or highly polished metals. V-grooves on jaw faces lock work in, holding it in any position desired, regardless of size or shape.

Available in 3-, 3½-, 4-, and 4½-in. jaw widths.

Magne-Grip Tool Co., 4900 W. Madison St., Chicago 44.

■



2-Stage Blast Air Gun

You get only a small volume of air for 9/10 of the control button travel. If you want the full blast, you pull button all the way.

Eliminates danger of having a cloud of dust or grit blown into operator's eyes. Built-in hook and swivel permits hanging hose without kinking.

Comes with ⅛-, ¼-, or ⅜-in. NPT connections and 5-, 10-, or 15-in. extensions.

Supreme Machined Products Co., Spring Lake, Mich.

Turn the page

11 MODELS

3 SCREEN SIZES

Pedestal Type
14" Diam. Screen

Bench Type
14" Diam. Screen
4 Models

Bench Type
5¾" x 7¾" Screen
3 Models

Unsurpassed Inspection Versatility

JONES & LAMSON OPTICAL COMPARATORS

The Essence of Quality Control

Jones & Lamson Optical Comparators are designed and built like rugged machine tools to withstand vibration and hard use. Yet they have the built-in accuracy to satisfy the most exacting laboratory standards.

- **They meet** the requirements of toolroom, laboratory and production inspection.
- **They precisely measure** height, depth, lead or spacing, as well as angles to degrees and minutes. They will measure to .0001".
- **They compare** intricately contoured parts with a master outline—and measure the amount of error.
- **They are convenient** to operate, easy to set up and read direct—*without computation.*
- **They operate** under normal lighting conditions. *No darkroom is needed.*
- **They will photograph** the enlarged shadow and record its relationship to a master chart.
- **Several persons** may study the shadow *at the same time.*
- **They will inspect** and measure surface contours, as well as profiles of objects such as type faces, stamping dies, punches, worn tools, etc.

Vertical Type
14" Diam. Screen

Direct
Projection
Type

Pedestal Type
30" Diam. Screen

P.S. A complete line of STANDARD CHARTS and FIXTURES is maintained by us.

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JONES & LAMSON MACHINE COMPANY
505 Clinton St., Springfield, Vt., U.S.A.

Machine Tool Craftsmen Since 1835

COMPARATOR DIV.
Dept. 710

Jones & Lamson Machine Company
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Springfield, Vermont, U. S. A.
Please send Comparator Catalog No. 402.

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COMPANY _____

STREET _____

CITY _____ STATE _____

NO INSTRUCTIONS NECESSARY WITH THIS EXTINGUISHER!

IT'S A RANDOLPH!

From bracket to blaze in split seconds! No valves to turn, no nozzles to adjust; just point and press your thumb and Randolph's cloud of snowy CO_2 kills fire completely!

Non-damaging Randolph CO_2 evaporates without a trace, is non-toxic, won't conduct electricity, deteriorate or freeze. And *all* Randolph Models are Underwriters' Approved.

A complete line of extinguishers and automatic systems

Learn how Randolph gives your plant panic-proof, positive fire protection! Write Randolph Laboratories, Inc., 4 E. Kinzie St., Chicago 11, Illinois.

RANDOLPH SIMPLIFIED FIRE EQUIPMENT

MISCELLANEOUS EQUIPMENT

Begins on page 200

Corrosion-Proof Surfacing Material

You can cut costs of chemical-proof construction and maintenance by trowelling a ⅛-in. coating of Ceilcrete on existing concrete surfaces. Eliminates the need, in most cases, for acidproof brick, according to manufacturer.

Ceilcrete cures into a hard, dense stone-like surface that has a rated load-carrying strength about four times greater than dense concrete.

Ceilcrete Co., 4832 Ridge Rd., Cleveland 9.

■

Standard Size Acoustic Panels

You can now get acoustic panels with a noise-reduction coefficient of 0.95 in two standard sizes for greater application economy.

Panels are made of galvanized steel, aluminum, copper, or stainless steel and can be used in operating temperatures up to 1100F.

Standard sizes are 36x48x4 inches and 36x96x4 inches. Units are perforated with 3/32-in. diameter openings on 3/16-in. staggered centers.

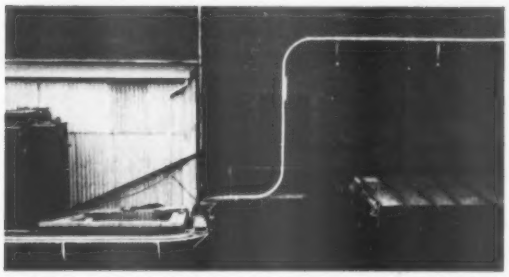
Industrial Acoustics Co., 333 Jackson Ave., New York 54.

Turn the page

FAST WAY TO WIRE NEW OR OLD PLANT

Cable being pulled around the first of 5 right angle bends of a 500 ft pull. Note racks can be hung from a roof projection and mounted on a stand.

A simple catenary suspension carries racks between buildings—underground construction is eliminated—cable on racks is always available for visual inspection.



Racks to carry the cable can also be mounted on the side of a building. This photograph shows 4 right angle bends.

Flexibility of interlocked armor cable is demonstrated here—corners and projections present no installation problems.

Ford Motor Company rewired plant, saved money, maintained production by using G-E No. 1799 varnished-cambric-insulated interlocked armor cable system

It's quite a feat to rewire a plant in a hurry, keep costs in line, and maintain production at the same time. But the Ford Motor Company did just this in their Canton, Ohio plant—they used General Electric's No. 1799 varnished-cambric-insulated interlocked armor cable system. All cables shown in the illustrations are 3-conductor, 500,000 CM for 15 kv service.

Installation speed—The ease and speed with which this interlocked armor cable system can be installed lowers costs. The cable can be laid quickly—indoors or outdoors—in long lengths, around corners, on *low-cost* aluminum *racks*. Engineering time is cut. Threading or bending of conduit is eliminated. Splices are of a simple mechanical type. Ford saved months, not days, because of these features.

Permanent—To our knowledge, no installation of interlocked armor cable has ever suffered mechanical damage sufficient to cause electrical failure. It is versatile as well as permanent and makes a neat, clean-looking installation. For more information about the G-E No. 1799 varnished-cambric-insulated interlocked armor cable system, write Section W57-134, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

Saves money at low voltages, too

G-E No. 1799 varnished-cambric interlocked armor cable also saves money at low voltages as indicated in the chart below.

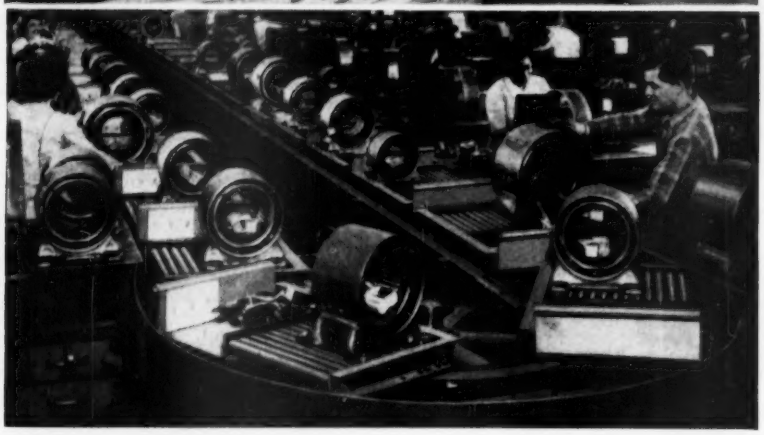
Rated capacity 2000 amperes at 480 volts	Pounds of Critical Material per 100 Feet		Cost per 100 Feet
	Copper	Steel	
Varnished cambric insulation in interlocked armor cable*	**2375**	**1160**	**$3000**
Impregnated asbestos and varnished cambric in steel conduit	2781	4140	$3954
Varnished cambric and braid in steel conduit	2781	4140	$3966
Type RH rubber insulation in steel conduit	3475	4910	$4660
Aerated bus-way	3000	3990	$4976

*Figures based on steel racks. Aluminum racks are normally used because they are lighter and easier to handle.

You can put your confidence in—

GENERAL ELECTRIC

IF YOU HANDLE OR ASSEMBLE MANY PIECES—PARTS—UNITS—ITEMS—ARTICLES—AS PART OF YOUR PRODUCT...



Standard Conveyors can speed operations

Keeping things moving — avoiding "bottle-necks" — on production, assembly, processing or packaging lines can be done better, faster, and cheaper *mechanically* with conveyors.

Your needs in conveyors — ranging from power and gravity conveyors, roller, belt, slat, chain, push-bar, sectional — to portable, self-contained conveyors — spiral chutes — pneumatic tube systems — can be met at Standard, with a conveyor experience record of more than 45 years. Write — Address Dept. FM-13.

STANDARD CONVEYOR COMPANY
General Offices: North St. Paul, Minnesota
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Write Dept., FM-13 for Standard's General Catalog and tell us what you want to convey.

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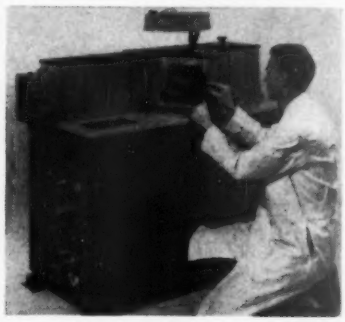
VERTICAL LIFTS • PNEUMATIC TUBE SYSTEMS

MISCELLANEOUS EQUIPMENT

Begins on page 200



For Recording Position vs. Time Relationship

This unit is designed for the study of self-luminous transient events such as explosive, flash tube, and spark-discharge phenomena.

You set up event to be studied in front of the vertical slit visible in upper left corner of machine. You obtain photographic record of event on 4x5-in. film in holder shown between operator's hands. Operation is based on the action of a mirror that rotates at 50,000 rpm. and wipes image onto film at a sweep rate of 5.466 millimeters per microsecond.

Beckman & Whitley, Inc., San Carlos, Calif.

■

To Alleviate Symptoms of Silicosis or Emphysema

A new instrument for industrial dispensaries distributes, under positive pressure, drugs that dilate the small bronchial tubes of workers who have some silicosis or emphysema.

The instrument, called Pulmonary Ventilator, relieves shortness of breath and makes sufferers more comfortable, so they are better able to perform their work.

For more detailed information, write to manufacturer for Bulletin No. 1106-1.

Mine Safety Appliances Co., Pittsburgh 8.

Turn the page

HERE'S WHERE YOU START...

TO GET LOWER MATERIALS HANDLING COST...

These are facts that should interest every manufacturer:

1.—More than 30 percent of the cost of the average manufactured product comes from handling expenses.

2.—Handling adds nothing to the value of the product.

3.—Reducing handling costs is the one way to lower product costs without sacrificing quality.

4.—Four out of five plants could further reduce handling costs.

5.—The Powell representative is a material handling expert who will be happy to work with you in developing the most efficient handling system possible.

There are Powell representatives serving the 54 largest industrial areas in the nation. For the name of the one nearest you check the yellow pages in your phone book or write direct. He'll be happy to give you the benefit of his wide experience with no obligation whatsoever.

POWELL PRESSED STEEL SINCE 1920

THE POWELL PRESSED STEEL CO., HUBBARD, OHIO

ORIGINATORS OF ALL STEEL COLD FORMED MATERIALS HANDLING EQUIPMENT

(In Greater Youngstown) Dept. 113

Here's ONE Expense you CAN Cut 75%!

(AND WE'LL PROVE IT TO YOU RIGHT IN YOUR OWN BUILDINGS AND YARDS)

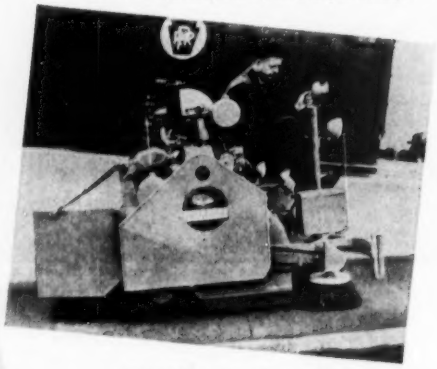
You CAN cut your sweeping expense 75% with a WILSHIRE Power Sweeper ...and have cleaner floors and paved areas, inside and out. In addition, you save wear and tear on tires on mobile equipment and damage to precision machinery caused by abrasive dust. You also reduce fire and safety hazards.

INSIDE

WILSHIRE Power Sweepers are built in 3 standard widths for sweeping 24", 36" and 48" swaths. There is a model to meet your needs, depending on the size of your door openings and the width of aisles and corridors. Sprinkling or sweeping compounds are not required. This patented WILSHIRE "Duscon" System picks up dust as you sweep.

OUTSIDE

WILSHIRE Power Sweepers not only sweep faster . . . they sweep cleaner. With the operator riding; rate of sweeping is maintained hour after hour without fatigue . . . on windy days as well as in good weather. Head, tail and spot lights are provided for continuous service on Models 1000 and 1000-S. Plenty of power to climb ramps and grades.



EVERYWHERE A MAN CAN HANDLE A BROOM

Easy, positive steering, short turning radius and unobstructed visibility for the operator make it easy to sweep right up to walls and posts. The Side Sweeper, available on most models, is easily adjusted for sweeping deep or shallow gutters. The WILSHIRE Power Sweeper does everything a man can do with a broom . . . better, faster and safer.

MAIL THE COUPON TODAY

*For data on how you can cut YOUR sweeping costs 75%**

Wilshire Power Sweeper Co.
526 W. Chevy Chase Dr.
Glendale 4, California

Please send me your illustrated brochure with data on sweeping.

Name_____

Company_____

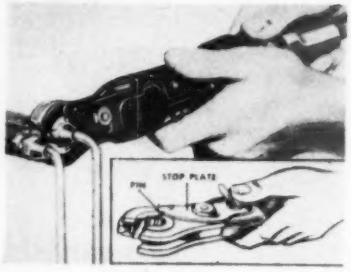
Address_____

City_____ Zone____ State_____

IN CANADA • PLANT MAINTENANCE EQUIPMENT CO • VANCOUVER & TORONTO

MISCELLANEOUS EQUIPMENT

Begins on page 200



Open-End Ratchet Wrench

This versatile tool enables your workers to use air power for what would otherwise be tedious, time-consuming operations with hand tools.

New design of unit stops socket positively in open position. A stop is built into the side plate of the wrench. When operator's thumb is pushed against this stop, it moves forward, engaging a pin in the socket which is automatically stopped in open position for quick removal and engagement of the next nut.

Comes in two sizes capable of handling hex nuts ranging from ⅜ to ¾ inches across flats.

Keller Tool Co., Grand Haven, Mich.

■

Electrostatic Paint Spray Equipment

The new Ionic Gun charges paint electrostatically inside of spray apparatus. It eliminates use of conventional external electrically charged screens.

With the Ionic Gun, paint is so highly ionized that it differentiates between painted and unpainted surfaces to produce an even finish and penetrate all cavities and crevices.

Unit includes an ionic high-potential power supply and control. It is available in range of 80 to 140 kvp., with power output of 110, 220, 440, or 550 volts.

Scientific Electric, 107 - 119 Monroe St., Garfield, N.J.

Turn the page

UNCLE!

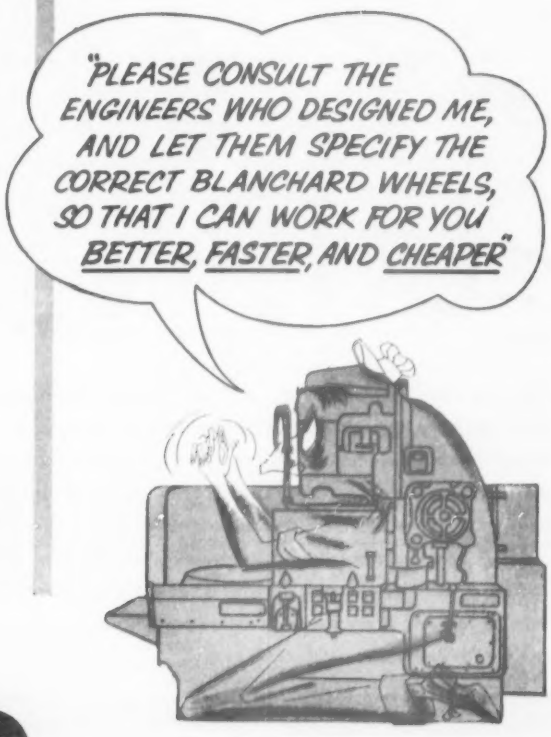
Are your machines begging for mercy because of misuse?

Blanchard Grinders, *with proper grinding wheels, can* and *do* give high production with extremely close tolerances for dimension and flatness. However, a No. 11 Blanchard user recently received erroneous advice on abrasive wheels from an outside source. The result was that 35 high-speed cam plates were ground on both sides in 1¾ hours with surface finish of 24 micro-inches.

By referring the problem to Blanchard, it was easily demonstrated that the No. 11, with correct grinding wheel, would give desired results—90 to 100 cam plates per hour, with surface finish of 4 micro-inches, dimension tolerance of ±.0002, and flat within 2 light bands.

Blanchard wheels are best for Blanchard Grinders — let Blanchard give you the benefit of their vast experience so that you too can get the most from your Blanchard machines.

Information on correct surface grinding procedure and wheel selection are given in "Work Done on the Blanchard" and "The Art of Surface Grinding." Write for free copies today!


"PLEASE CONSULT THE ENGINEERS WHO DESIGNED ME, AND LET THEM SPECIFY THE CORRECT BLANCHARD WHEELS, SO THAT I CAN WORK FOR YOU BETTER, FASTER, AND CHEAPER"

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

SPENCER VACUUM IN *Food and Chemical* INDUSTRIES

for CONVEYING · INSECT CONTROL · PACKAGING PRODUCTION · RECOVERY SANITATION

RICE

1½ H.P.

7½ H.P.

CHEMICALS

The time required for moving, cleaning, sorting and packaging valuable foods and chemicals has been materially reduced by Spencer Vacuum. Rice and powdered chemicals are handled by the ton. Excess powdered sugar is recovered from chocolate candies, the insect hazard removed at its source and the entire plant made continuously sanitary as an extra dividend, with the same Spencer machine.

Large areas, inaccessible spots in machines and tanks, above pipes and behind radiators are cleaned quickly with powerful vacuum tools. A Spencer size and vacuum tool for every purpose, including offices, boiler rooms and warehouses. Ask for the Bulletins.

427-A

THE SPENCER TURBINE COMPANY • HARTFORD 6, CONNECTICUT

SPENCER HARTFORD

MISCELLANEOUS EQUIPMENT

Begins on page 200

Industrial Wheel

This rubber-tired wheel is available in capacities ranging from 230 to 1140 pounds. It is equipped with cylindrical roller bearings which are lubricated through a 5/16-in. drive-type grease fitting.

High-tensile, solid rubber tires are puncture-proof and tear-resistant and are molded permanently to the wheels.

Available in variety of sizes—from the smallest hand truck to the heaviest industrial trailer.

Phillips Mill & Supply Co., 2324 Jane St., Philadelphia 3.

■

Traffic-Lane Paint-Marking Machine

You can start painting lines straight out from walls or curbs, or at a 45-deg. angle right or left, with the new Line-O-Matic marking machine.

Unit has automatic control that enables it to pass over a hole in surface without dropping paint into it.

Comes in 3 models with 3-, 6-, or 9-gal. capacities and maximum line widths of 4, 6, and 8 inches. Special-purpose models that can lay 2 or 3 parallel lines in different colors are available.

Freeman-Huntington Co., Box 42 North Station, Yonkers, N.Y.

Turn the page

Used every day!

DUTCH BRAND
PRESSURE SENSITIVE TAPE
Crepe Back — Flat Back
Extra Strength

DUTCH BRAND
PLASTIC TAPE
Shop Packages and Displays
Also .010" Plastic Individual Rolls

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Shop Package and Shelf Cartons

DUTCH BRAND
FRICTION TAPE
Shop Package and Displays

"DB" WIRE CONNECTORS
Four Standard Sizes

DUTCH BRAND

- PRESSURE SENSITIVE TAPES
- ELECTRICAL TAPES and CONNECTORS
- SPONGE RUBBER

DUTCH BRAND PRODUCTS
Aid In Maintaining Top Quality Standards

The well known dependability and top performance of DUTCH BRAND products is your best assurance of maintaining your products own high standards. Every DUTCH BRAND item is carefully made with exacting control and rigid inspection. They are quality products . . . order them from your distributor by trade name.

CHECK THIS LIST

ELECTRICAL TAPES

- Plastic .007"
- Plastic .010"
  - Master Shop Package
  - Jr. Shop Package
- Friction Tape
  - Jumbo Shop Package
  - Special Width
  - Narrow Width
  - ASTM Friction Tape
- Rubber Insulating Tape
  - Hippo Shop Package
  - ASTM Rubber Tape
- Electro Coil Tape
- Glass-Fibre Tape
- "DB" Wire Connectors

TAPES: Pressure Sensitive

- No. 300 Masking (Crepe Back)
- No. 301 Masking (Flat Back)
- No. 302 Extra Strength Masking
- No. 307 Drafting
- No. 353 OD Cloth Tape
- No. 350 Techni Tape
- No. 351 Double Tak
- No. 358 Twin Tak Tape
- Anti Squeak Tape
- Structural Glass Joint Tape
- No. 806 Rub'R-Cork
- Tite-Pak
- Tuff-Pak

RUBBER PRODUCTS

- No. 3832 Sponge Rubber Soft
- No. 4022 Sponge Rubber Medium
- No. 4030 Sponge Rubber Firm
- No. 4031 Sponge Rubber Hard
- Colored Sponge Rubber
- Neoprene Sponge Rubber
- Sponge Rubber Stripping
- Rubber Bonding Cement

DUTCH BRAND

VAN CLEEF BROS. INC.
Manufacturers of Rubber Products
DIVISION OF Johns-Manville
7800 WOODLAWN AVE. • CHICAGO 19, ILLINOIS

PLEASE SEND SAMPLE OF FOLLOWING PRODUCTS

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Name _____ *Title* _____

Company _____

Address _____

City _____ *Zone* _____ *State* _____

"LIGHTING COSTS CUT IN HALF,

thanks to the LUSTRA MAN"

(says Vick Chemical Co., Philadelphia, Pa.)

Mr. E. J. Mulvehill, Jr., Vick Chemical's Electrician reports:

"Our Lustra Fluorescent Lamps have set brand new service records, and since we adopted Lustra lamps —both fluorescent and incandescent—maintenance has been cut in half. In addition, the superior lighting afforded by Lustras has contributed importantly to general operating efficiency in our Philadelphia plant."

• • • •

It will pay you to talk with your local Lustra Man. He's thoroughly qualified to solve practically any lighting problem with the complete quality line of Lustra *Double Duty* Lamps, Fluorescent Tubes and allied electrical products. Write us and he will arrange an appointment. **Lustra Corporation, Dept. T-1, 36 Washington St., B'klyn 1, N.Y.**

Lustra

AMERICA'S DATED LAMPS

Double-Duty Reflector Lamps, Incandescent Lamps, Fluorescent Tubes, Spotlites and Floodlites, Rugged Duty Lamps, Fluorescent Fixtures and Starters.

Handy Water Purifier

Quickly removes minerals and makes water soft and chemically equal to triple distillation for use in pilot-plant operation, laboratories, and processing.

Unit employs efficient and economical mixed-bed on exchange resins for filtration. Hand model consists of flexible plastic bottle that you fill with water and plug into resin filter. Squeeze the bottle and raw water flows through filter and is instantly ready for use.

Also available as a larger unit (upper left) with built-in meter that constantly indicates exact purity of water.

Win Sales Co., Dept. HA-5, Box 257, Forest Hills, N.Y.

■

NEW 40-FT. ROLL CONTOURING LATHE, made by R. K. LeBlond Machine Tool Co., Cincinnati 8, features 2-directional hydraulic tracing that makes possible the turning of steep-angle contours. Two hydraulic motors are automatically controlled through a single valve as the tracing stylus follows the contours of a flat template mounted at the back of the lathe. Special demonstration will be held at company's plant Jan. 26-30. All interested in attending are invited to write to manufacturer.

Now . . . 2 New

AO COVERGLAS GOGGLES

Fit Over Safety

And Personal Glasses

NEW

Safety

Goggles

#326

#327

NEW — 4 WAYS!

1. New Cup Size and Shape
2. New Lens Size and Shape
3. New Side Shields
4. New Easy Lens Replacement

AO's newest development in eye protection—Chippers' and Welders' Coverglas Goggles—can be worn over practically every pair of personal glasses (even the biggest frames) and most types of safety prescription goggles *with and without side shield.*

Wider vision, too, because the lenses are larger and scientifically designed to give up to 20% more vision. Yet, with all these features the goggles weigh but a fraction of an ounce more than ordinary Coverglas goggles . . . cost only slightly more.

These goggles are the newest . . . and two of the greatest . . . developments since the advent of safety goggles. Get all the facts about these two outstanding Coverglas goggles from your AO Safety Products Representative. He can supply you.

QUICK FACTS

- Lens easily replaceable from rear (not front) by means of a spring clamp—no tools needed
- Lightweight, brown plastic cups fit face snugly, won't conduct heat or electricity
- Light-tight side shields for welders (on No. 327 goggle) provide indirect ventilation
- Bridge—High-grade leather. Instant adjustment
- AO worker-lab tests show much greater field of vision and increased comfort
- All-rubber headband, easily adjustable

"326" Chippers' Coverglas goggle supplied with regular Super Armorplate lenses. "327" Welders' Coverglas goggle supplied with regular Noviweld lenses and cover lenses.

AO's Industrial Vision Program Increases Production, Decreases Accidents. Write today for booklet "Improved Industrial Vision" to 1011 Vision Park, Southbridge, Mass.

American Optical

SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

"PC Glass Blocks give us the necessary to the ideal

says **ALGOT J. E. LARSON**

President and General Manager
Art Metal Construction Company
Jamestown, New York

• The Art Metal Construction Company's new office building reflects the viewpoint about functional office building design of the world's largest manufacturer of steel office furniture. As leading advocates of the value of lighter finishes for desk tops and other furniture surfaces in offices, they know firsthand the important bearing that a proper visual environment has on employee comfort and morale and how this can greatly improve office efficiency and production.

To quote Mr. Larson further: "It was our very consciousness of a good visual environment in offices that led us to use PC Soft-Lite* Prism B-55 Glass Blocks in our new office building.

PITTSBURGH CORNING CORPORATION

visual comfort office,"

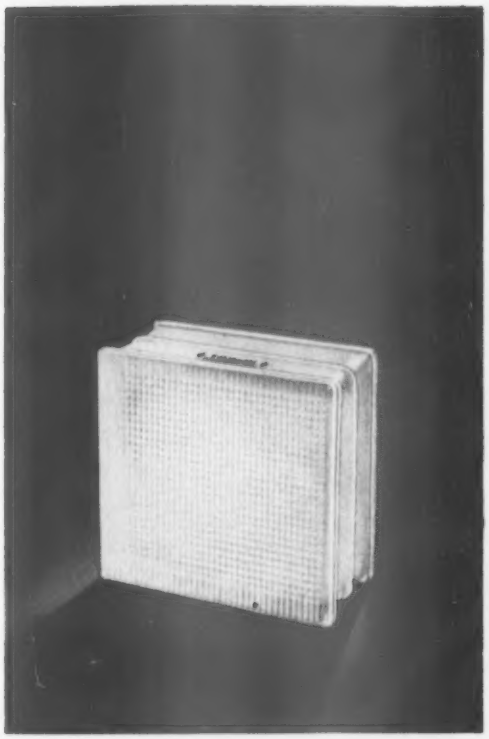
The Pittsburgh Corning Light-Directing Glass Blocks have created a natural indirect lighting system in our offices. They get an abundance of glare-free daylight back into the work areas where it is needed most, and we are proud to say that our light colored office equipment and walls, ceilings and floors help make the most of the daylight your glass blocks have made available."

You can get the same results when you install PC Glass Blocks in new buildings, or use them to replace old, worn-out sash. And PC Glass Blocks have actual money saving features. There's no wood or metal sash needing periodic puttying, painting or caulking. They save on maintenance — no small, individual panes to clean. They save on heating and air-conditioning expense, because PC Glass Blocks have more than twice the insulating value of ordinary windows.

But this is only part of the story. For complete information, why not fill in and return the coupon? There's no obligation.

*T.M. Reg. Applied for

PITTSBURGH 22, PENNSYLVANIA



Architects: Freeburg and Lindquist, Jamestown, N. Y.;
General Contractor: Warren Construction Company, Jamestown, N. Y.

Only PC Glass Blocks give all these advantages!

- **Better Daylighting**
- **Less Maintenance**
- **Reduced Heating Costs**
- **Less Outside Noise**
- **Greater Privacy**
- **Less Condensation**
- **Attractive Appearance**
- **"Clean-Easy Face Finish"**

PITTSBURGH PC CORNING

Pittsburgh Corning Corporation
Dept. P-13, 307 Fourth Avenue
Pittsburgh 22, Pa.

Please send me a FREE copy of "PC Glass Blocks—The Mark of a Modern Building."

☐ Send engineer to discuss specific problem.

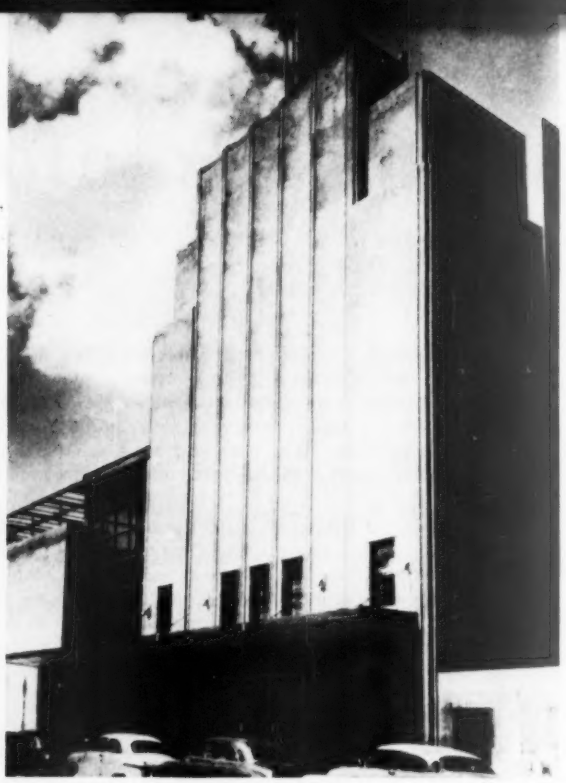
☐ Advise nearest source of supply.

Name .....

Address .....

City ..... State .....

TELEVISION POWER BREAKER. The 500-kva G-E unit substations at WWJ-TV have voltage ratings of 4800-208Y/120, are equipped with Type AK-1-25 air circuit breakers.



WWJ's NEW BUILDING houses studios of Detroit's pioneer TV station. General Electric load-center system furnishes power for amplifying, lighting—other station requirements.

Detroit's new TV studios rely on

Power continuity assured for all studio requirements at WWJ-TV by secondary-selective distribution system

For the engineers of WWJ-TV—Detroit's pioneer TV station and an affiliate of WWJ, the world's first commercial radio station—a dependable source of continuous power rates first consideration in planning the new television studios. Total or even partial power shutdown cannot be tolerated.

At its new studios, WWJ-TV needs reliable power for lighting and amplifying . . . for its monitor panels and relaying equipment . . . for all station auxiliaries such as fans and blowers. To assure reliable power continuity for these many exacting requirements, Giffels & Vallet, Inc., L. Rossetti, associated engineers and architects, and Jack A. Frost, electrical contractor, installed a G-E secondary-selective load-center system consisting of two 500-kva unit substations.

With this distribution system, the station gains, too, in savings basic to load-center power. For example, a G-E engineered load-center system maintains consistent voltage for top operating efficiency, keeps voltage drop down to a minimum, provides less costly feeder breakers, and reduces cable costs.

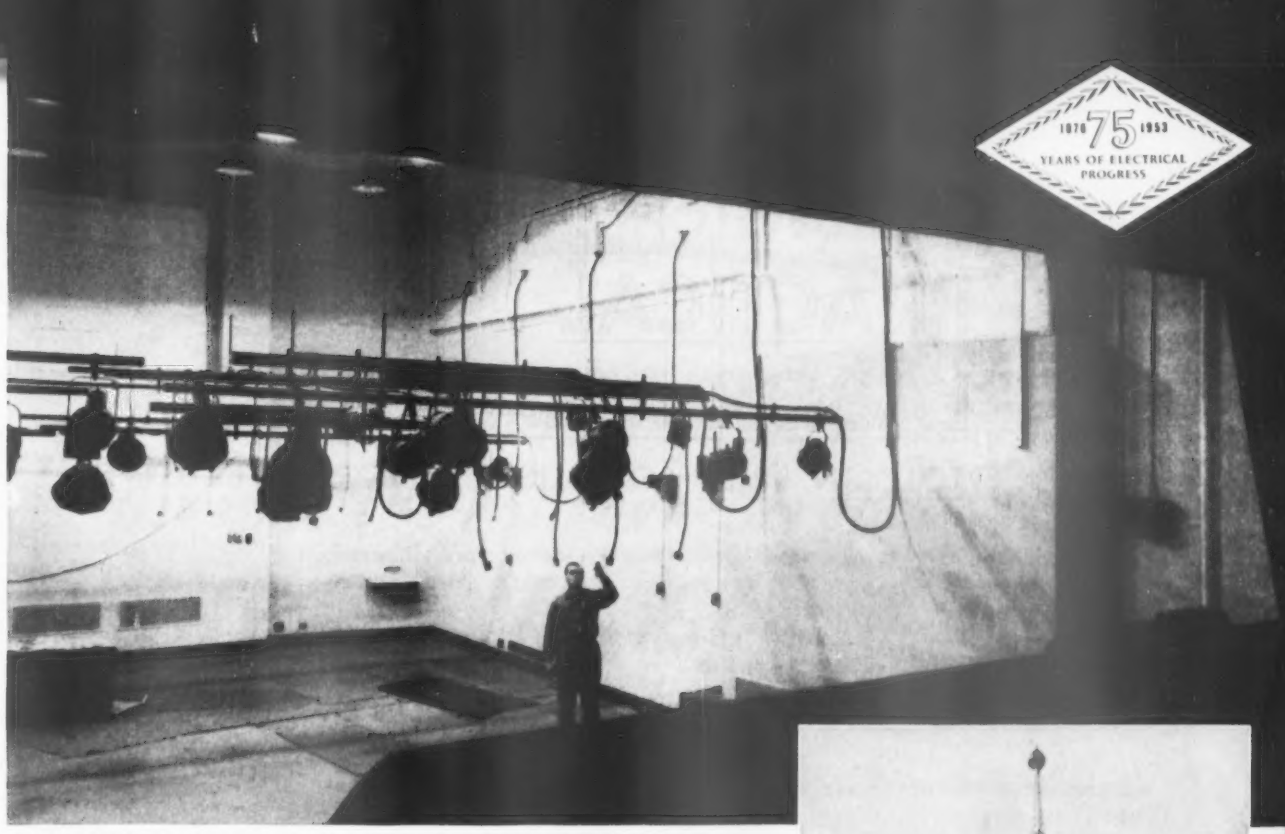
Air circuit breakers, with ratings properly coordinated with transformer capacities, give adequate interrupting capacity and isolate troubles in feeders. Oil fuse cutouts are interlocked to prevent opening with load on transformers.

Flexible layout permits easy, quick maintenance without interruption of power. System flexibility itself provides for addition of new loads, making it far less costly for the station to expand in the future. Grounded, metal-enclosed G-E load-center units, with noninflammable Pyranol* transformers assure maximum protection for operating personnel.

For further information on G-E engineered load centers, call your local G-E sales representative, or write for GEA-3592, General Electric Company, Schenectady 5, N. Y. 321-87

*Reg. Trademark of General Electric Co.

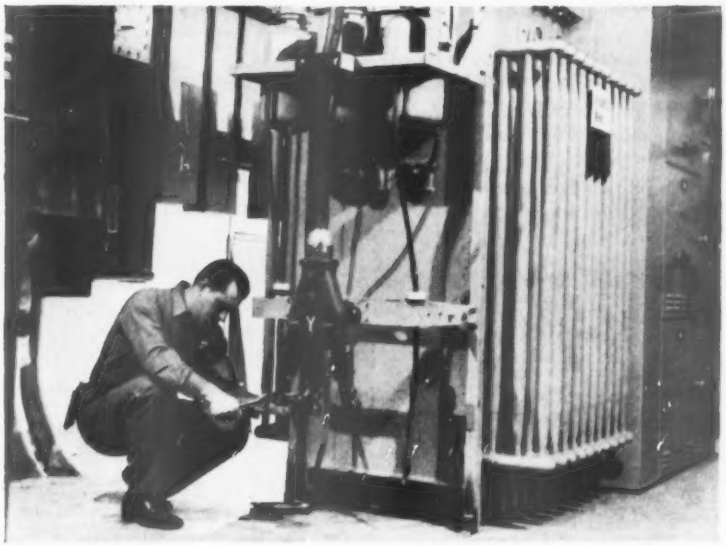
GENERAL ELECTRIC



1878 75 1953 YEARS OF ELECTRICAL PROGRESS

LIGHTS FOR TV PRODUCTION. Studio construction shot from WWJ-TV's control booth shows battery of lights necessary for televising. Lighting throughout the new station is fed from G-E engineered load centers.

G-E load-center system



CUTOUTS FOR PROTECTION. Engineer wires pothead of incoming high-voltage cable to cutouts on transformer of TV lighting breaker. Oil cutouts are interlocked, cannot be opened or closed with load on transformer.

PENOBSCOT BUILDING—Detroit's highest—houses all of WWJ-TV's transmitter equipment. TV antenna tops highest central portion. Here are transmitted programs originating in new studios powered by G-E load centers.

SIGNIFICANT DEVELOPMENTS IN PRACTICAL LABOR RELATIONS

TOLD IN BRIEF FOR BUSY FACTORY EXECUTIVES

By **PAUL A. KING,** *Attorney Bigelow-Sanford Carpet Company, Inc. Member, New York Bar*

NO DISCHARGE FOR HEAT-WAVE STRIKERS. *They're protected by the Taft-Hartley Act, says NLRB* . . . . . **Page 218**

PITFALL IN UNION WELFARE PLAN. *Seems you can't limit benefits to union members only* . . . . . **Page 218**

MUST UNIONS HAVE LAST WORD BEFORE AN ELECTION? *NLRB Chairman Herzog feels they shouldn't* . . . . . **Page 220**

THESE ACCOUNTANTS ARE NOT "PROFESSIONALS." *So the Labor Board includes them in office and clerical bargaining Unit.* . . . . . **Page 222**

MUST YOU PAY TO "BAWL OUT" WORKERS? *Despite the value of such meetings to the employee — as compared to discipline — this company had to pay* . . . . . **Page 222**

NEW CROSS-REFERENCE SHEET ISSUED BY WSB. *Helps you find what you need to know in preparing to file a WSB application* **Page 224**

WHO CAN PUNISH WILDCAT STRIKERS? *The employer may be able to — but can the union?* . . . . . **Page 224**

ASKER PAYS FOR ARBITRATION TRANSCRIPT. *At least, that's the way one arbitrator sees it* . . . . . **Page 226**

NO FIRE INSPECTORS IN GUARD UNION. *They just aren't considered guards* . . . . . **Page 226**

BRIEF BUT IMPORTANT. *Watch your pension plans . . . Unemployment insurance pay ban for strikers clarified . . . New kind of petition covers up ring leaders . . . Federal court revises NLRB on foremen discharge* . . . . . **Page 228**

No Discharge for Heat-Wave Strikers

This is not the time of year to be concerned about 90- to 97-deg. temperatures (unless you have a particularly hot operation). But you may want to hold on to this recent National Labor Relations Board decision for your own future reference.

The NLRB ruled that the temperature in a plant is a working condition. Therefore, if workers walk out in protest against 90- to 97-deg. temperatures they are engaging in a "concerted activity" that is protected by the law. If you fire these workers, you commit an unfair labor practice.

In the case in question, the temperatures hit 90 to 97 degrees for 5 days. The air conditioning unit broke down. On the fifth day, a group of workers walked out to cool off. They returned in a few minutes. A spokesman of the group who complained about the situation was fired; the rest were laid off and finally fired after they had begun to start a union. (*Southern Silk Mills*)

Pitfall in Union Welfare Plan

If you are tempted to negotiate one of those welfare plans open only to your union employees, watch out. The National Labor Relations Board has just ruled that a union welfare plan can-

For greater safety, handling ease, and adaptability...

Give me the Polisher-Scrubber with THESE EXTRAS!

- 2-Way Automatic Feather-Touch Safety Switch. Works from both sides of insulated handle.
- Combination Worm Gear and V-Belt Drive. Provides extra protection for motor and gears.
- Center Brush Feed. Eliminates splashing of equipment, furnishings, and mopboards.
- Truly Balanced and Really Quiet Operation!
- Dispenser (accessory) for Applying Hot Wax Mechanically. This process reduces frequency of waxing.

A 600 Series Finnell. Four sizes: 13, 15, 18, and 21".

The *combination of extras* at right not only wins the appreciation of maintenance men, but appeals to thrifty, safety-minded management as well. In operating a *600 Series Finnell*, no effort is required to hold the *feather-touch safety switch* to *'on'* position. And the switch works with either hand from either side of handle! When grasp is released, the switch automatically disengages and the machine stops. *Brush-propelled*, it glides over the floor with virtually effortless guidance. True balance is attained through proper distribution of weight per square inch of brush surface in relation to thrust and brush speed. Indicative of the quality construction of a *600 Series Finnell* are: G. E. Drip-Proof Capacitor Motor (furnishes abundant power) . . . worm gear of special phosphorus gear bronze, meshing with worm of hardened, ground, and polished gear steel . . . New Departure Ball Bearings. Although essentially a polisher-scrubber, with suitable accessories the machine can also be used to apply wax, dry-scrub, steel-wool, sand, and grind.

Another of the *extras* offered by *Finnell* is *nation-wide service!* There's a *Finnell Floor Specialist and Engineer* near you to help solve your particular problems . . . to train your operators in the proper use of *Finnell Equipment* . . . and to make periodic check-ups. It's also good to know that *Finnell makes everything for floor care!* For demonstration, consultation, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 2501 East St., Elkhart, Ind. Branch Offices in all principal cities of the United States and Canada.

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PRACTICAL LABOR RELATIONS

Begins on page 213

not discriminate against employees who are *not* members of the union. The case came up this way:

A Washington (D. C.) shop, Jandel Furs, contributed 2% of the earnings of all its employees —union and non-union—to a welfare fund. The fund was set up under a contract with a local of the International Fur and Leather Workers. Benefits (health, hospitalization, and death) were limited to members of the union in good standing only.

The NLRB ordered the company and union not to restrict the benefits to union members.

Must Unions Have Last Word Before Election?

Here's a National Labor Relations Board case where Chairman Herzog comes up with a strong dissent on the age-old question of who should have the "last word." He says:

"I had not supposed until today that this Board believed that its obligation to assure a free choice in elections included a requirement that labor organizations, like others sometimes thought weaker, must always have the last word."

It appeared that way to Herzog because of these facts:

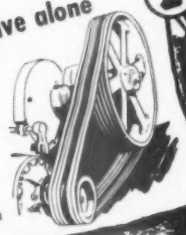
Just before a representation election, an employer made a speech to his employees explaining his position. But he made the speech at the last minute. By this timing, it was impossible for the union to get in its licks.

The NLRB majority thereupon set aside the election, saying that the employees had been deprived of equal opportunity of hearing both sides under equal circumstances. The Board paid no attention to the employer's con-

What do you do when your v-belts get loose or break?

1 **Leave the drive alone**

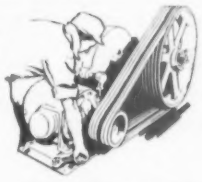
You get more slippage
- ...wasted power
- ...excessive belt wear
- ...uneven sheave wear
- ...less production



2 **Slide the motor back**

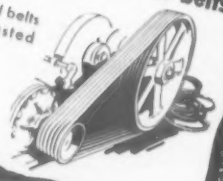
Tight belts get too tight

Life of belts and bearings is reduced



3 **Install a new set of belts**

Discarded belts mean wasted money



4 **Use VEELOS...**

Only with VEELOS...

the adjustable v-belt—can you get *all* these operating advantages. And *only* with Veelos can you eliminate costly v-belt inventory because just four reels of Veelos in the O, A, B and C widths can replace up to 316 different sizes of endless v-belts.

VEELOS DATA BOOK...

The plain facts on construction, installation and use of Veelos are included in this illustrated Data Book —write for your copy.

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Link construction permits quick installation
Easy adjustability
...provides controlled tension on each belt
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Keeps your machines running for *profitable* production

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Organized Maintenance Control is a practical means of increasing efficiency and reducing costs. The ways in which such a program is implemented—reorganization of the maintenance department, improved maintenance methods, a "preventative" maintenance inspection system—vary in different plants.

A necessity in any maintenance control program, however, is the *written* job order.

TelAutograph 'Instan-Form' communication allows Maintenance Control to originate job orders, authorize and schedule work and notify accounting department of estimated maintenance expenditure—all in one writing, at the same time.

'Instan-Form' telescriber communication eliminates the need for multiple carbons and hand delivery of orders. It assures clear, indelible messages on your own Maintenance Job Order forms.

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PRACTICAL LABOR RELATIONS

Begins on page 218

tention that the union had not requested rebuttal time. The timing made such request futile, said the Board. (*Foreman and Clark, Inc.*)

These Accountants Are Not "Professionals"

The NLRB rules that a water company's "engineering evaluation accountants" are not professional employees. These are included, therefore, in an office and clerical bargaining unit.

Here are the NLRB's reasons: The accountants have no college degrees; they do not take trial balances or make up profit and loss statements. They exercise judgment primarily as to allocation of labor costs but the allocation must be made according to the rules of the state Public Service Commission. Finally, the knowledge of these accountants may be acquired by a study of the company's accounting system. (*New York Water Service Corp.*)

Must You Pay to "Bawl Out" Workers?

Sometimes a supervisor may not wish to discipline an employee or group of employees or give out warning slips. Taking everything into considreation, he may feel that a "talking to" will be more effective. So he calls a meeting (during working hours) of the employees who violated a rule, and spends about an hour lecturing them.

Sounds like a good idea. But when a supervisor of the Johnstown Plant to Bethlehem Steel did it, the union raised the question of paying the workers for the time thus spent. Bethlehem didn't feel pay was called for.

But an arbitrator ruled other-

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ARE YOUR BEST POWER BUY— AT ANY PRICE

They ASSURE high maneuverability of trucks . . . rapid, accurate handling of material. PROVIDE uniform rate of material handling with no unscheduled down time. SHOW lowest costs of operation, maintenance, repair, depreciation . . . inherently safe. Call in an Exide representative, and let him prove these facts.

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PRACTICAL LABOR RELATIONS

Begins on page 218

wise. He conceded that the meeting helped the employees as well as the company. It avoided precipitous disciplinary action. It gave employees a chance to explain their misconduct. It promised to increase plant efficiency. But he couldn't see why the workers should suffer loss of pay.

Cross-Reference Sheet Issued by WSB

The Wage Stabilization Board has issued a new "Cross Reference Sheet" aimed to help you find out what you need to know in preparing an application for WSB action. The sheet covers the most common types of adjustments in compensation. It includes:

- Various kinds of adjustments.
- Pertinent WSB regulation or resolution covering each adjustment.
- Application form to be used.
- Guide or instruction sheet showing the data to be included in the petition.
- Number of copies of the form required.
- Place to file the petition.

For copies of the sheet, go to WSB in Washington, or any of the 14 regional boards or 30 field representatives. Ask for Form 504.

Who Can Punish Wildcat Strikers?

Under most union contracts the company can fire or discipline wildcats strikers.

But if the company chooses not to? Can the union then discipline them? Looks like the answer is yes—at least in the mind of Arbitrator Herman Gray.

The question arose in a dispute

KELLER

Pneumatic Tools

SAVE TIME--REDUCE COSTS

in running down screws and nuts

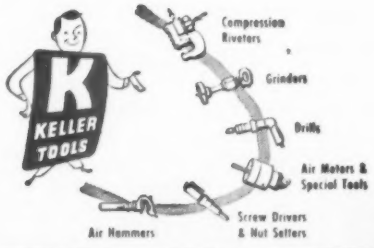
Two views of the instrument panel assembly line in an automobile plant

Only demonstrated performances would induce America's largest automobile manufacturers to equip their assembly lines with Keller air-powered screw drivers and nut setters.

Experience has shown that Keller Air Tools offer distinct advantages:

1. LIGHTER, EASIER TO HANDLE, with a balance that reduces worker fatigue
2. FEWER INTERRUPTIONS for service because of extremely simple construction
3. INTERCHANGEABLE PARTS reduce stockroom inventory of service parts
4. ADAPTABILITY to different jobs because of interchangeable parts, and a wider variety of attachments and accessories —all readily obtainable

We suggest that you discuss your assembly problems with the Keller tool application engineer near you. In all principal cities.



KELLER TOOL COMPANY, GRAND HAVEN, MICH.

Maintenance Costs C-U-T

through efficient

TRASH BURNING

● Among the results that come in trash burning with Brulé Incinerators are—simplifying and lowering normal costs of handling — cutting time — making space available for production purposes now used for trash storage. You can burn 500 lbs. of usual plant wastes per hour with same reduced to but one pound of ash.

This specially engineered unit is the result of 40 years' experience in designing and manufacturing units for trash disposal. Every service-proved feature to insure dependability and economy are included. No fly ash, soot, sparks, odors, nor property contamination.

This unit, operating on as low as an 18 ft. refractory-lined stack, easily bolted into place, is quickly available for packaged delivery and on-the-site assembly.

BRULÉ

FG4-T5 Patented—Packaged

INCINERATORS

Each firebrick in the arches is hung on cast iron hangers and sidewall courses also include supports. This arrangement frees the brickwork from mechanical stress. Each piece thus adjusts itself under temperature changes.

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PRACTICAL LABOR RELATIONS

Begins on page 218

between the International Longshoremen's Association, Marine and Warehousemen (AFL), and a group of wildcatters. Gray ruled that a union's authority to discipline comes from its constitution. In this particular case, it had the power to fine, suspend, or expel a wildcat striker after a hearing—but it did *not* have the right to deprive a worker of his seniority.

Asker Pays for Arbitration Transcript

A union and employer agree to share the fees of an arbitration, with each party to bear the expenses of his own presentation. Under this condition, who pays for a reporter to prepare a verbatim transcript?

The union said that the arbitrator did not need such a report. The employer argued that he *did* need it. So they left it up to the arbitrator himself. He ruled that it was up to the party asking for the service to pay for it. There was no requirement to share the cost—unless the union wanted a copy of the transscript. (*Mutual Telephone Award*)

No Fire Inspectors in Guard Union

The Taft-Hartley Act excludes plant guards from a bargaining unit containing other kinds of employees, or from a union admitting non-guards.

Question came up whether fire inspectors in the Briggs automobile parts manufacturing plant had to be left out of a unit of guards.

The National Labor Relations Board rules that fire inspectors are *not* guards, so they're out.

Turn the page

PAYLOADER
Changes losses to profits
at Ideal Cement Stone Co.

VALUABLE HANDBOOK

Tells how and where to look for signs of inefficient bulk materials handling . . . how to analyze, organize and set up an efficient handling system. Plus many useful tables and data. Write for "Bulk Materials Handbook" — it's free.

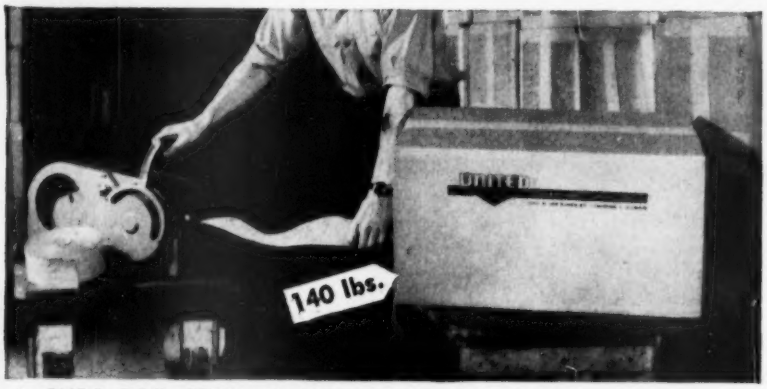
The making of sills and lintels was an unprofitable but necessary evil with this concrete block manufacturer until a "PAYLOADER" arrived on the job to take over the material handling part of the operation. Now, profits have replaced losses. The "PAYLOADER" picks up 1,000 lbs. of sand at a time from a stockpile, carries it 65 feet through narrow aisles and unloads it directly into the mixing machine. A second mixer has been added and the "PAYLOADER" operator runs both. Although fewer men are required, production is much greater and the manufacture of lintels, instead of being carried on at a loss, has become a profitable part of the business.

This is one of thousands of cases where "PAYLOADERS" have made tremendous economies in time, manhours and production costs, both inside and outside of plants — unloading box cars, digging, stockpiling, carrying, loading and spreading bulk materials. "PAYLOADERS" are available in a complete line of sizes and models up to 1½ cu. yd. capacity — a size for every plant and purpose. They are sold *and serviced* by 200 Hough Distributors nationwide. The Frank G. Hough Co., 755 Sunnyside Ave., Libertyville, Illinois.

Angier

No matter what your cartons weigh . . . . . .

SAVE *when you seal 'em the* SNAKE TAPE - *way*



▲ **SUBS FOR STEEL STRAP** Snake Tape is *reinforced* to give strap-like strength. Here 140 lb. cartons of auto parts are quickly sealed to stay sealed. (United Parts Mfg. Co.)

◀ **3 TIMES FASTER**
Because Snake Tape is so strong, only TWO strips are used. Cuts sealing time two-thirds over previous method. (Atlas Collapsible Tube Co.)

▼ **SAVES DAMAGE**
Center seamed sealed for *sure* protection at lowest cost.
(A. L. Hansen Mfg. Co.)

Free!
20 yd. sample
Snake Tape is gummed, waterproof and reinforced! Easily dispensed by "cut off" type machines. Send now for sample and facts.

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Framingham 1, Massachusetts
Distributors in Principal Cities

PRACTICAL LABOR RELATIONS

Begins on page 218

BRIEF BUT IMPORTANT

► **Watch your pension plans** if you come under Massachusetts jurisdiction. Compulsory retirement of persons "between the ages of 45 and 65" for age reasons alone is "void and of no effect" there. The Massachusetts Commission Against Discrimination warns that it's against the law. An employee, however, can be forced to retire *after* his 65th birthday, says the Commission.

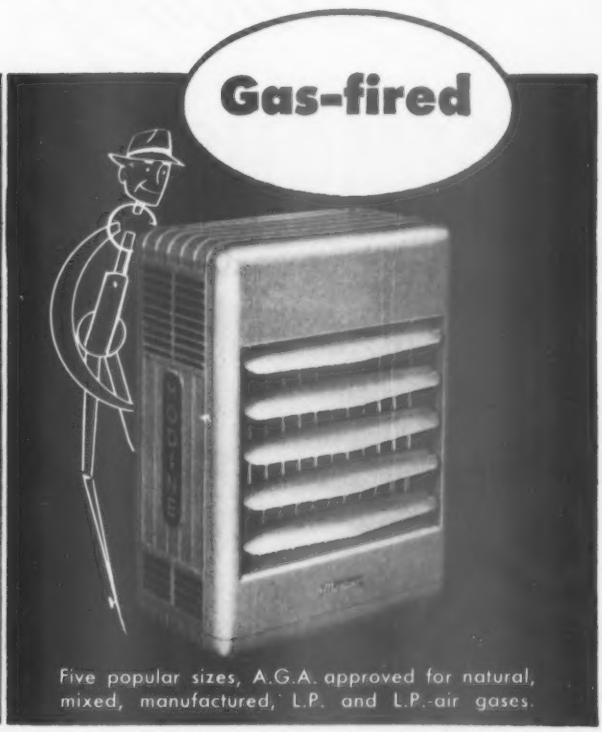
► **Employees out of work because of a strike** can't receive unemployment insurance under California law—as in many other states. Here's a further clarification of that rule: The California State Supreme Court just ruled that mill workers of the Pacific Lumber Co. of Scotia were ineligible despite the fact that the company had served discharge notices on them when they refused to go through a woodsmen's picket line.

► **Here's a new form of petition,** designed to hide the identity of ring leaders: The signature part of the petition is in the form of a segmented pie. Each petitioner signs his name on one of the wedges. Thus, there is no "top man" for management to spot as a ringleader.

► **The NLRB is reversed** by a Federal Court which rules that a foreman *can* be fired for refusing to do production work during a strike of rank-and-file workers.

Which type of unit heating do you require?

Built in Horizontal (illustrated), Vertical Delivery and Power Throw types — 47 different models.



Five popular sizes, A.G.A. approved for natural, mixed, manufactured, L.P. and L.P.-air gases.

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Special heating coil designs for steam and for hot water assure best performance for each type of system. Discharge air temperatures of 110-120° F are correctly related to air velocity for heating at its best. All-copper coils defy corrosion because fins are bonded to tubes and tubes are brazed to headers. Pre-formed tubes with individual expansion bends absorb stresses, assure long life.

Modine

GAS-FIRED UNITS

Modine is the only gas unit with both *stainless steel* heat exchanger and burner. Lighter weight means easier, less expensive installation, plus faster heat delivery — *within five seconds* after thermostat calls for it. Individually fired tubes provide higher heat transfer. Elongated ports — four times free area of conventional drilled ports — minimize clogging and simplify routine cleaning.

When you ask Modine for a unit heating recommendation, you're sure of an unbiased answer. For Modine builds steam, hot water *and* gas-fired units . . . in a broad range of types and sizes. There's no need for our heating experts to fit your job to a limited line.

Equally important, Modine has been a leader in unit heating for 25 years. Balanced design of all models assures you of perfect heating comfort with maximum fuel economy. For the right unit heater for your requirements, see the Modine representative listed in your classified phone book. Or write Modine Mfg. Co., 1505 DeKoven Ave., Racine, Wis.

GET THESE FREE BOOKS — Ask for Bulletin 149-A on steam and hot water and Bulletin 652 on gas-fired unit heaters.

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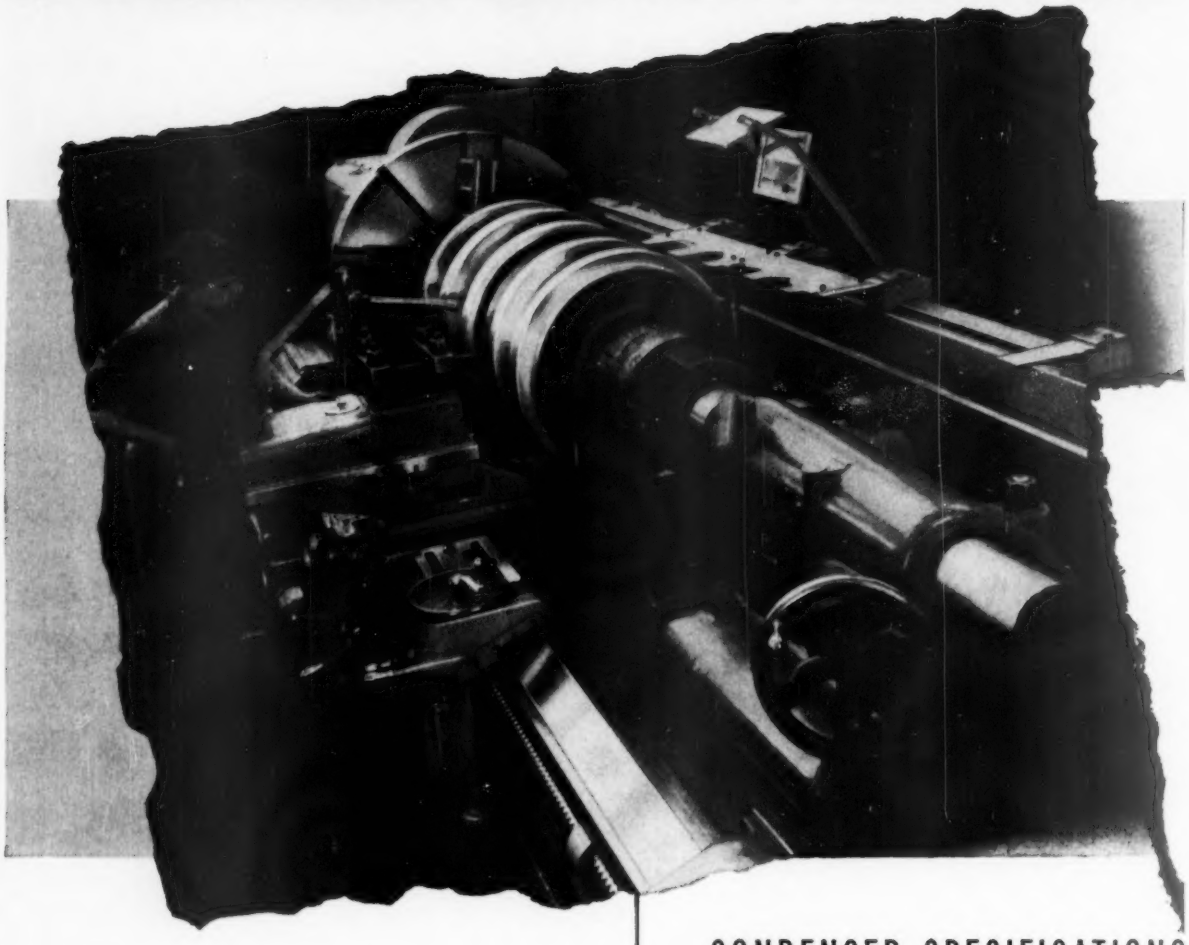
Modine **UNIT HEATERS**

Coming Soon...

A DEMONSTRATION: LEBLOND



Two-directional hydraulic tracing uses simple template.

Tracing stylus controls cross and length feed, powered by hydraulic motors.

All controls at apron; speed and feed can be varied during cut without interrupting the finish.

Fast roughing by means of length feed only—template serves as length stop.

Mechanical power rapid traverse to carriage and cross slide in both directions built into apron. Also, hydraulic rapid traverse for retracting cross slide when under tracer control.

Standard feeds and threads available through quick change box—hydraulic motors disconnected through fool-proof interlock.

USERS REPORT SAVINGS OF MORE THAN 75%.

CONDENSED SPECIFICATIONS

Lathe size	32"	40"	50"
Swing over cross slide	22"	28"	35"
Constant hp DC motor, 2 to 1 speed change	30 hp	40 or 50 hp	
Mechanical speed changes in head	8	9	9
Speed range, variable, rpm	2.5-230	1-165	1-165
Hydraulic Feed	VARIABLE		

Single speed AC drive also available.

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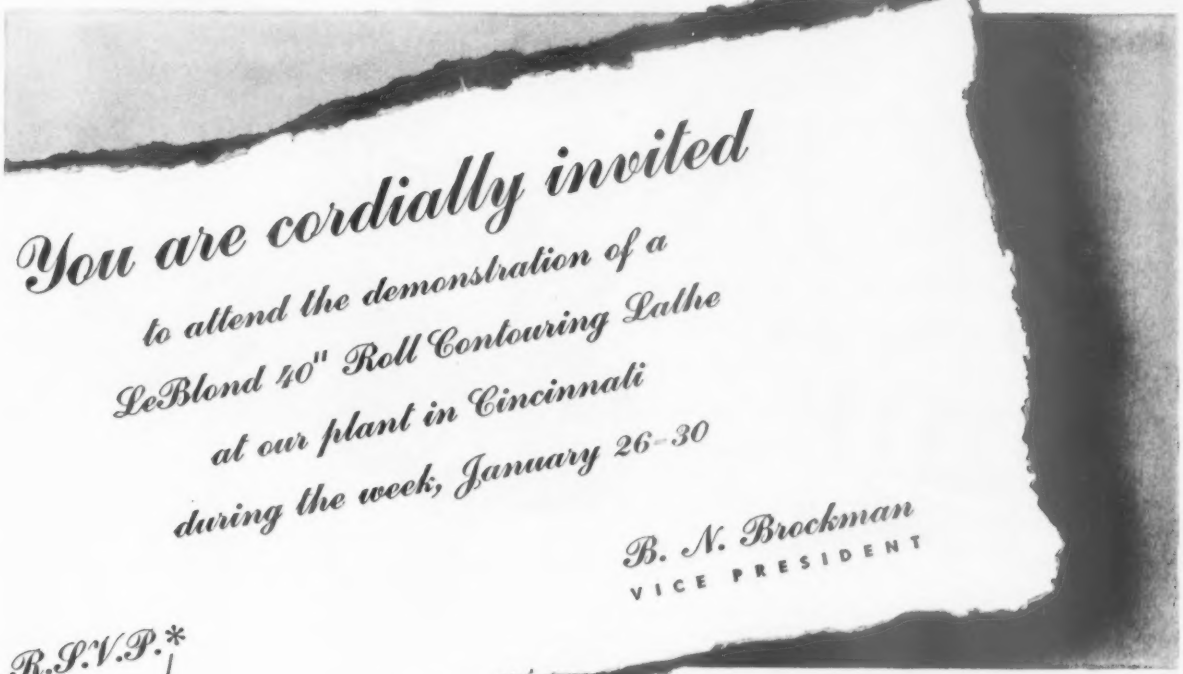
See it in operation at the LeBlond Plant

JANUARY 26-30



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How much does materials handling add to your production costs? Along assembly lines? Around machine tools? On loading platforms? In and out of storage? Handling materials is the largest single cost item in most plants. Start licking it now!

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the P&H *Line*

Labor Turnover— and What to Do About It

By JOHN PERRY, Straus & Perry, Washington, D. C.

The time to stop a quit is when he walks in the door. Which means, in the final analysis, that only *you* can solve the problem of labor turnover in your own plant. But here's information that will give you a big head start in doing that job.

Author Perry's practical analysis of what's behind turnover and his suggestions on how you can go about licking the problem are based on operating experience in a variety of plants. The ideas worked there. They can work for you, too.

ONE INDUSTRIAL WORKER IN FOUR walked away from his job in 1951. There were 3.8-million quits, and half a million discharges. The totals for 1952 will not differ greatly.

No one knows precisely how much this turnover costs industry. My private estimate—$1¼-billion—seems about right, since half of those who see it think it's too low, and the other half think it's too high. But, whatever the figure, it's more than industry can afford in these times of rising labor costs.

ARE HIGH WAGES REALLY TO BLAME?

Some employers are resigned to high turnover. "It's the times," one told me. Another said, "It's the class of labor we get today. People just don't want to work."

But by far the most common explanation of why workers quit is the high wages paid by "the aircraft plant down the street." This isn't surprising. "Better pay" *is* the quitting worker's usual explanation. And why not? It's a safe explanation, and offends no one.

How many men who quit actually *do* go to better paying jobs? On the evidence available, the answer is: well under half. If this were not so, how could we explain why so many high-paying industries have high quit rates?

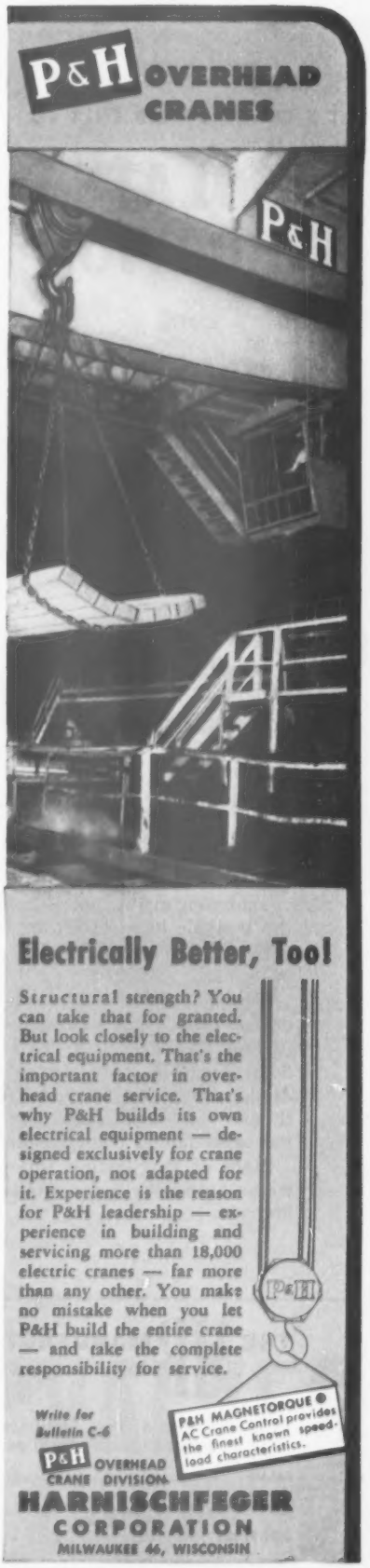
No, what causes quit rates to rise is not rising wages. It's increased job opportunities.

The quit rate does not measure dissatisfaction within a plant. It measures the ability of dissatisfied employees to find other jobs!

During the 1938 recession, quits dropped to the lowest point in recent history. Surely this is more logically explained as the result of a real scarcity of jobs than as the result of a sudden, temporary improvement in employee relations.

WHY MEN QUIT

To do much about labor turnover, you must first know some basic facts about the *real reasons* why men quit. I recently saw the results of a survey which had asked a group of men why they had left their jobs. Their answers, neatly tabulated in order of frequency, made a scientific-looking exhibit—quite impressive. The only trouble with it was that it was based on three highly questionable assumptions: (1)


P&H OVERHEAD CRANES
P&H
Electrically Better, Too!
Structural strength? You can take that for granted. But look closely to the electrical equipment. That's the important factor in overhead crane service. That's why P&H builds its own electrical equipment — designed exclusively for crane operation, not adapted for it. Experience is the reason for P&H leadership — experience in building and servicing more than 18,000 electric cranes — far more than any other. You make no mistake when you let P&H build the entire crane — and take the complete responsibility for service.
P&H MAGNETORQUE ® AC Crane Control provides the finest known speed-load characteristics.
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HARNISCHFEGER CORPORATION
MILWAUKEE 46, WISCONSIN

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ISOLATE VIBRATION and SAVE MONEY

. . . with ISOMODE* PADS

Here's the durable mounting to absorb shock . . . reduce noise . . . cut your maintenance costs. In hundreds of installations, the Isomode Pad has proved to be not only one of the most economical mounts, but also one which does a superior job of isolating vibration.

This 5/16" thick, ribbed, resilient mounting works under legs or base of most equipment—even under large capacity punch presses! By absorbing the forces normally transmitted to floor, Isomode Pads reduce building damage and undue deterioration of machinery. With no bolting in most cases, it costs you less to install machines — to relocate them. And you get a quieter plant, besides.

Made of long-lasting DuPont Neoprene that resists oil, water, aging. Write for details — discover their surprisingly low cost.

*Trade Mark Reg. U.S. Pat. Off.

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1080 State Street, New Haven 11, Conn.

Please send data sheet containing more information on Isomode Pads and how to install them easily and quickly.

NAME..... TITLE.....

COMPANY.....

ADDRESS.....

LABOR TURNOVER

Begins on page 233

that each man had a single "principal" reason for quitting; (2) that he was aware of the reason; (3) that he could, and would, explain the reason in words.

The reasons given were probably honest enough. But they did not reveal *why* the men quit. They revealed only the "trigger reasons."

As anyone who has quit a job knows, the decision to do so is usually anything but simple. Even acute discontent may not force a decision to act; the worker must first build up his justification. He may actually end up with several sets of reasons—including a private set for himself!

Once a man has his justification for quitting all lined up, he's working on borrowed time.

The gun is loaded and cocked; only the pull on the trigger is needed. It may be a reprimand, or a minor grievance. It may be a plant condition that seems to affect all employees equally, *but only those prepared to quit will do so.*

HOW HELPFUL ARE TURNOVER STATISTICS?

You can certainly use monthly labor turnover figures as a guide, but they require careful interpretation. This is particularly true where you want to make industry or area comparisons.

For example, a shipbuilding plant shows turnover running 20% a month—an annual rate of 240%. An oil company with many scattered operating units has an annual rate of only 5%, less than ½% per month. And an electronics plant is in between.

In a case like this, you're probably no better off with the figures than without them. They can be dangerously misleading if taken at face value. The erratic shipbuilding industry can't hope to match the stable employment picture of the other two industries. Nor can you fairly compare the petroleum industry with electronics, where large num-

Turn the page

ELIMINATE COSTLY DOWN TIME

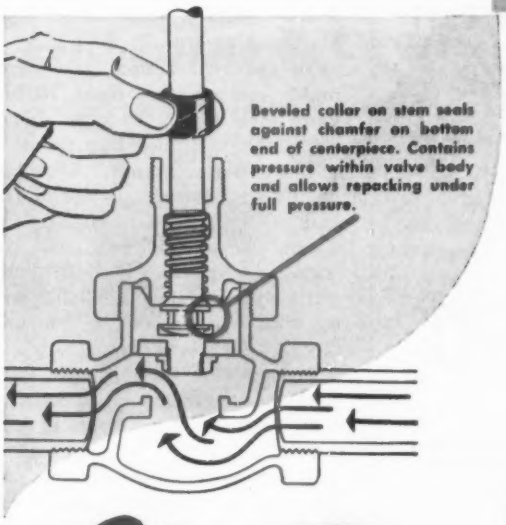
Repack
UNDER FULL PRESSURE

With O-B industrial process or maintenance valves, you don't have to shut down a line just to replace worn packing. Simply open the valve all the way and remove the packing nut. In the full open position, the stem effectively seals off line pressure, allowing the packing to be replaced safely and quickly without even a moment's interruption of line service.

In these days of capacity production, downtime is particularly costly. Why not eliminate this unnecessary expense by specifying O-B the next time you need standard pressure valves for steam, air, water, gas, or other industrial service?

You will find a complete line available from your local Ohio Brass distributor. Call him today for any of your bronze valve needs.

OHIO BRASS COMPANY · MANSFIELD, OHIO


Beveled collar on stem seals against chamfer on bottom end of centerpiece. Contains pressure within valve body and allows repacking under full pressure.

O-B No. 11 Line Valve Featuring Outside Screwover Bonnet. Globes and Angles Available ¼ to 3 inches in size. 150 pounds W.S.P. 300 pounds W.O.G.

4100-V

Ohio Brass VALVES

BRONZE GLOBES ANGLES GATES AND CHECKS

SOLVE MANPOWER PROBLEMS

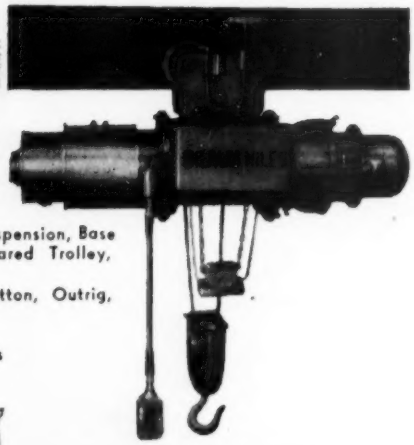
with a SHEPARD NILES Electric HOIST

● One man replaces many — and moves more goods faster — with a Shepard Niles Electric Hoist. These sturdy hoists free valuable floor space, put waste ceiling area to work, enable an older man, woman or youth to handle heaviest loads with ease.

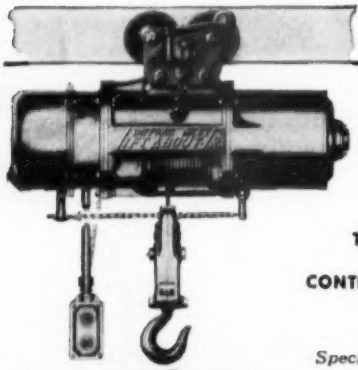
Learn how a Shepard Niles Hoist — in light, medium or heavy capacity — fits into your production picture. Call in the Shepard Niles representative — he'll make sure you get the right capacity and controls for your handling job.

TWO FAMOUS HOISTS

Heavy-Duty SHEPARD NILES Hoist



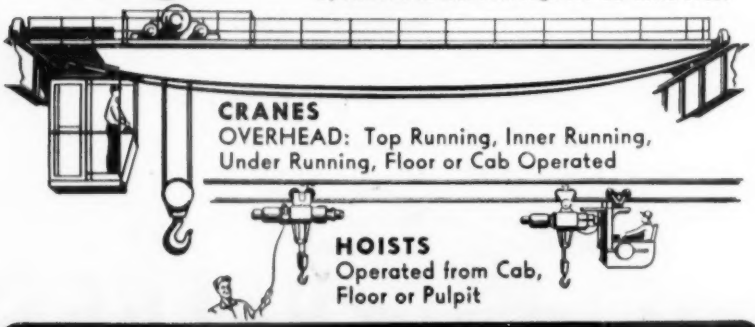
TYPES: Lug Suspension, Hook Suspension, Base Type, Push Trolley, Geared Trolley, Motor-driven Trolley
CONTROLS: Pendant Rope, Push Button, Outrig, Remote
CAPACITIES: 500 to 40,000 lbs.
SPEEDS: To meet your requirements
Write for Bulletin 127



LIGHT SERVICE, LOW COST LIFTABOUT-JR.

TYPES: Lug Suspension, Hook Suspension, Push Trolley
CONTROLS: Single Speed, Push Button, Rope Control
Write for Bulletin 171

Specialists in loads through-the-air since 1903.



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OVERHEAD: Top Running, Inner Running, Under Running, Floor or Cab Operated

HOISTS
Operated from Cab, Floor or Pulpit

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LABOR TURNOVER

Begins on page 233

bers of women workers boost the turnover rate.

The warning against careless comparisons cuts two ways: An employer who boasts of a quit rate below the national average may not necessarily be as well off as he thinks. And the plant that's worse than the national figures may be doing all right. Here, for example, are the February 1951 figures for an electronics company, compared with industry figures:

	Plant	Industry
Quit	3.2%	2.1%
Discharge	1.1%	0.3%
Layoff	0.3%	0.8%
Miscellaneous	0.3%	0.6%
Total	4.9%	3.8%

Is that good or bad? Quit and discharge rates are higher than the industry average. This can readily be explained away as the result of unusual local conditions. ("Local conditions" are always different!) But here's the hard fact: If this plant's rates are maintained for 12 months, and if employment averages 3000 workers, quits and discharges will require the hiring of 1680 replacements. This is deplorable, of course. But it suggests no explanation or course of action.

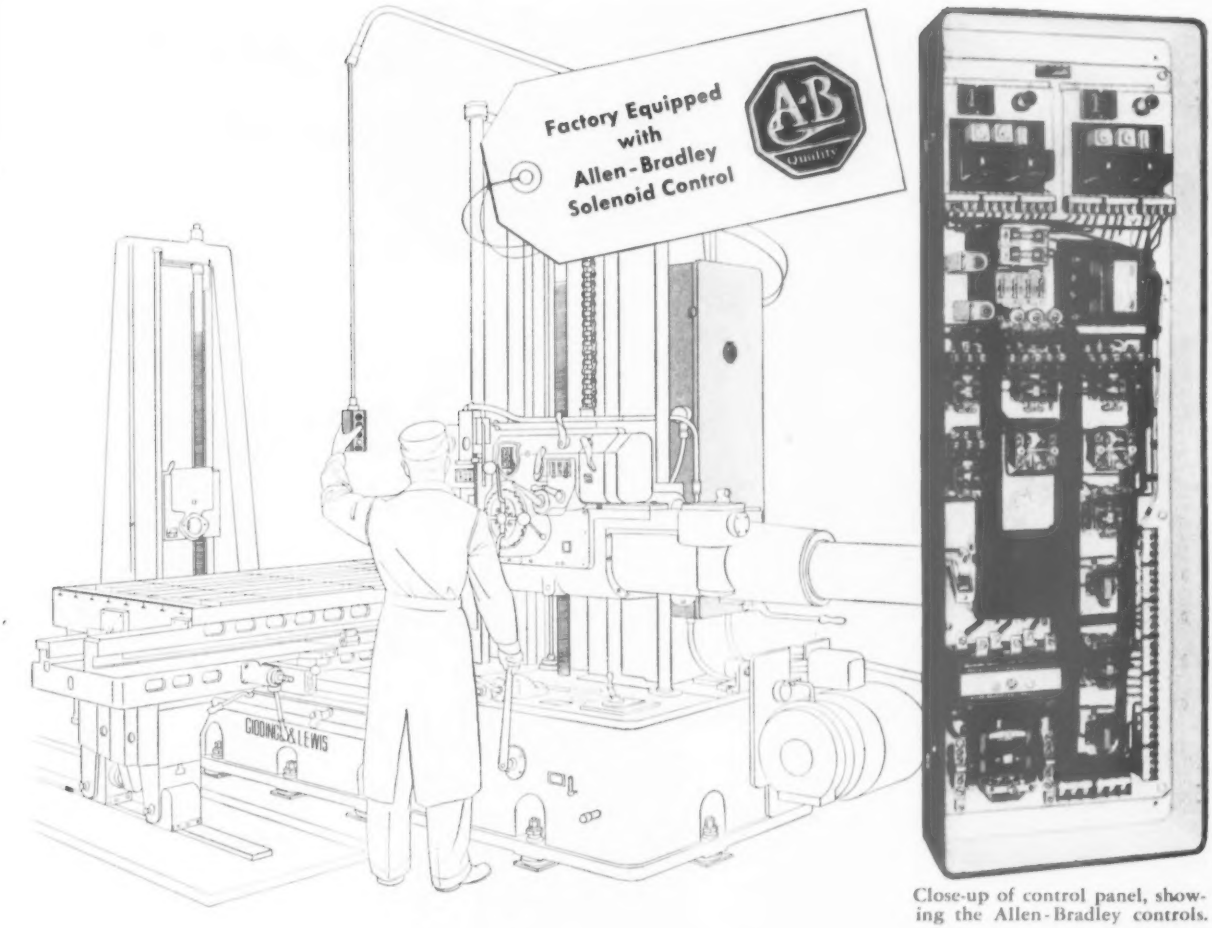
To get real action, you must make comparisons right within your own plant. You get clues out of doing things like these:

1. Compare trends. Seasonal trends are normal. A peak at the end of summer or a dip before Christmas, for example, will hit some businesses. But if your quits this February, at 3.2%, are 0.5 above last February, someone ought to ask why.

2. Compare departments. Department 9 has a quit rate of 6.1%. Department 7's rate is only 1.2%. Why?

3. Compare jobs. Quits in one job class are running over 10% monthly. Is the trouble in the wage scale, the nature of the work, the supervision, or the training? Are you hiring the right kind of people?

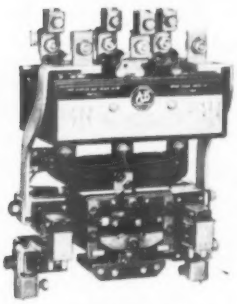
4. Check length of service. The quit rate runs out the roof the



Close-up of control panel, showing the Allen-Bradley controls.

Giddings & Lewis HORIZONTAL BORING MACHINE

uses Allen-Bradley Automatic Positioning Control



Allen-Bradley Bulletin 709, Size 5 Contactor up to 300 amperes.

This Series 30 table type machine, built by the Giddings & Lewis Machine Tool Company of Fond du Lac, Wisconsin, performs boring, drilling, and milling operations. Allen-Bradley motor controls provide automatic positioning control.

Manufacturers of large production equipment install Allen-Bradley controls because they are so reliable. The simple construction of Allen-Bradley controls assures millions of trouble free operations.

Dependable components on precision equipment is a recognized sales asset. Specify Allen-Bradley controls for your motor-driven machines.

Allen-Bradley Co., 1321 S. First St., Milwaukee 4, Wis.

A-B Quality

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL

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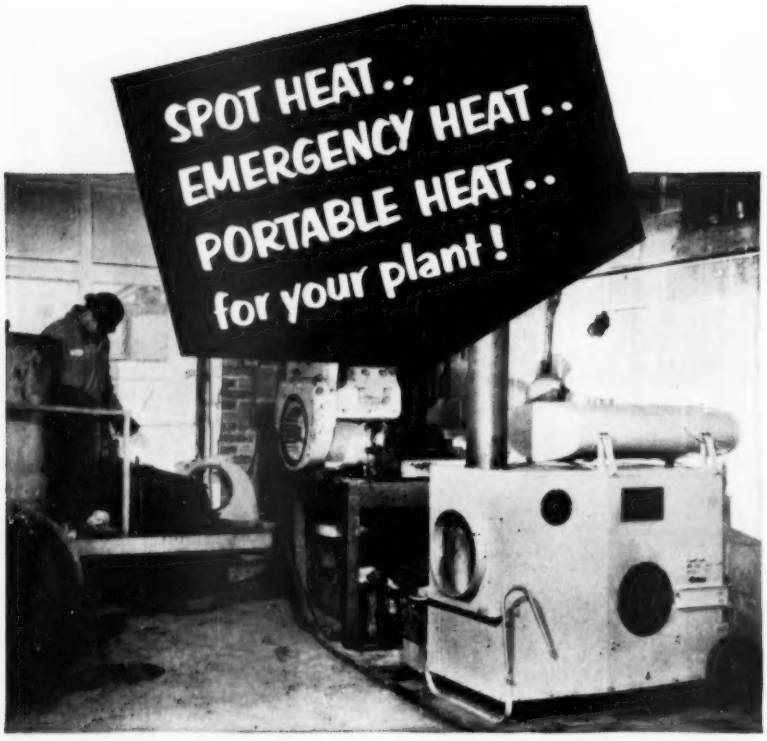
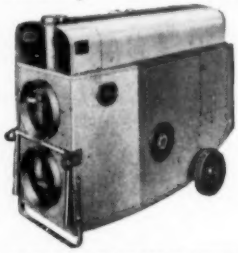


You can avoid layoffs, speed work in cold areas, protect perishable goods in a warehouse or provide supplementary heat for those extra cold days with safe, economical Herman Nelson Portable Heaters. Heat on wheels may enable you to continue operations during emergencies created by power failures or a breakdown of your regular heating system.

The only completely safe Portable Heater that uses flexible ducts to spot heat where most needed—and remember, only uncontaminated air heaters are absolutely safe!

Herman Nelson Portable Heaters are available in three models. Cost as little as $360. Easily moved and operated by one man.



HERMAN NELSON DELUXE I
Capacity 280,000-450,000 BTU/hr. Completely automatic, including temperature control. Fresh air delivery 2,000-2,350 cfm. Oil fired, electric powered. Other models available—with gasoline or electric power—and capacities from 125,000 to 385,000 BTU/hr.

Find out how to put portable heat to work for *you*. Mail this coupon today.

Herman Nelson Division, Dept. 75
American Air Filter Company, Inc., Moline, Illinois

Gentlemen: Please send information about Herman Nelson Portable Heaters; also my free copy of HEAT-ON-WHEELS FOR INDUSTRY.

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LABOR TURNOVER

Begins on page 233

first 30 days after you hire employees. Why? Again, are you hiring the wrong people? Are you giving new workers inadequate induction and early training?

These and other breakdowns you may think of won't tell you the **why** of turnover. But they suggest pointedly where you should seek the answers.

WHAT TO DO ABOUT TURNOVER

Turnover is a guide to a problem. But, despite its very real cost, it is not the heart of the problem.

Some turnover is inevitable, and no doubt some is desirable. But turnover is too high, regardless of the percentage rate, if it reflects serious dissatisfaction in the plant. Quitting isn't the only way in which dissatisfaction is expressed, and some of the other ways can be more expensive than turnover itself.

But how do you know when there's dissatisfaction? Fortunately, there's a simple method of checking up. It's a method you can use without even leaving your desk. Admittedly, it's a rule-of-thumb method, but it's surprisingly accurate. Here it is:

Simply ask yourself, "Is management dissatisfied?" Are productivity, quality, maintenance, housekeeping, supervision, safety, and other key factors up where they should be, in the light of your production goals? Do things get done as management would like to see them? Does management have confidence in second-line executives and first-line supervisors? Is management getting all the information it needs and wants?

If you and your management are dissatisfied, chances are good that supervisors and workers will also be dissatisfied. It's that simple!

Then what to do? To reduce turnover, your choice lies between waiting for a return of mass unemployment (stupid, of course),

Pick out the tough spots on your production line . . . key spots where a breakdown means a costly shutdown. Then find out how the Coffing Quik-Lift's dependability really pays off. This hoist is a full-fledged production unit, built to stand up under hard assembly-line use. Its "tough spot" performance will soon repay its cost many times over in down time saved. So do as many others have done. Start the Quik-Lift on a hoist assignment where others have failed — then standardize on Coffing after it has proved its value the hard way.

For more information on Quik-Lift Electric Hoists, write for Bulletin M1E.

COFFING HOIST COMPANY

Danville, Illinois

sold by distributors everywhere

Hoist-Alls • Safety-Pull Ratchet Lever Hoists
Mighty-Midget Pullers • Spur-Gear Hoists
Differential Chain Hoists • Load Binders
I-Beam Trolleys

Presses transmit less vibration, increase floor and machine life, when mounted on UNISORB.

PLANT AFTER
PLANT AFTER PLANT
REPORTS
MACHINE MAINTENANCE
IS REDUCED

with

UNISORB®

MOUNTINGS

You can eliminate the floor damage and time required for using bolts and lag screws — when you mount machines on UNISORB.

You reduce transmitted machine vibration 60% to 85%, depending on the type of machine. That means increased life for machines and floors. UNISORB also makes it easier to install or re-locate machines. Just cement the mounting to machine and floor.

Write for your free copy of our booklet describing UNISORB, the modern mounting pad that is also available pre-coated with adhesive for machines that don't require shimming.

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Plant Maintenance Show — Booth 109

LABOR TURNOVER

Begins on page 233

or meeting the problem head-on. Meeting it may cost a little money, but waiting costs more. **Here are five basic steps to consider seriously:**

1. Put the personnel operation in tip-top shape. Often the budget for personnel administration is in fixed ratio to total payroll, a ratio that has little to do with the work load of the personnel staff. A realistic analysis of current work load may reveal the need for more staff. An analysis of the plant's needs may suggest the need for a more scientific approach to selection and placement than was necessary a few years ago.

2. Strengthen your induction and training of new workers. Orientation of new employees may take care of itself when there are only a few each month, when personnel men have time for leisurely interviews, when foremen aren't under pressure. Today it may be necessary to have both an orientation method and special personnel to handle it.

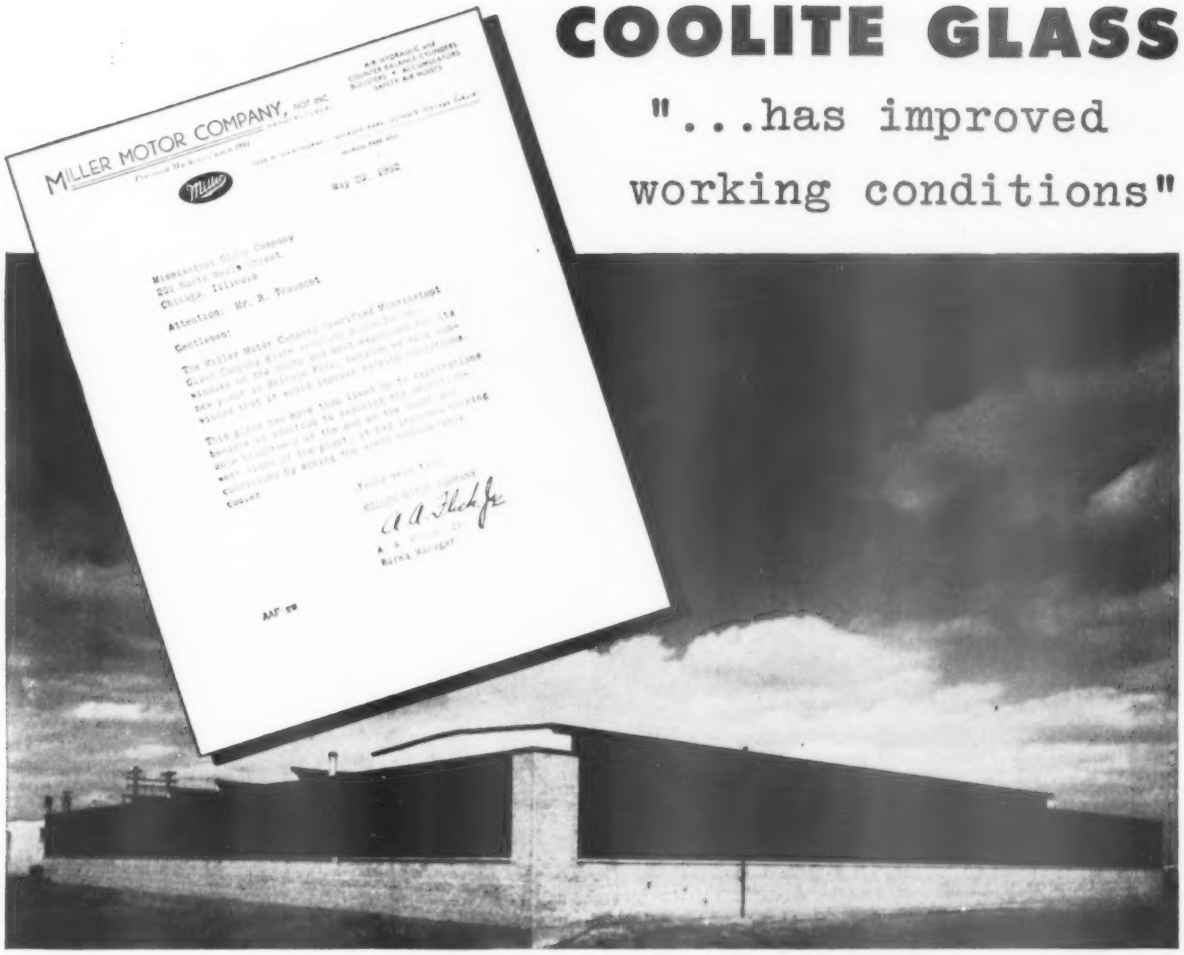
3. Make some one person your "training spark plug." As in World War II, more training directors are needed, especially by smaller plants. Their chief value is to introduce and maintain effective training methods. Can't afford such a man? How about part-time?

4. Give your foremen plenty of help. It is unpopular to suggest hiring more foremen or increasing foremen's salaries. But in some plants one or both measures are overdue. How about *your* plant? And it's a hard job to make supervisory training programs work. Yet, if you don't train your supervisors in the right way to do their jobs, they'll probably learn the wrong way on their own.

5. Bolster your employee relations. As used here, "employee relations" lumps together such specifics as benefit plans, working conditions, cafeterias, counseling, suggestion plans, incentives, and discussion groups, plus the broad-

COOLITE GLASS

"...has improved working conditions"



Miller Motor Company, Melrose Park, Illinois. John S. Cromelin, Architect, Hamilton Glass Company, Glazier.

Manufacturer of Air and Hydraulic Equipment Selects COOLITE GLASS by Mississippi to Cut Raw Sun Glare and Heat

Modern management knows that workers who see better, produce better . . . and this testimonial from a user of Coolite, Heat Absorbing, Glare Reducing Glass by Mississippi highlights the importance of "visioneering" in a modern plant. Coolite traps and absorbs much of the sun's heat—helps keep interiors comfortably cool. Coolite also filters out annoying glare, floods work areas with pleasantly tinted, softened, filtered light that cuts costly eye fatique.

Conditioned, natural illumination helps reduce operating costs—and Coolite is easy to maintain, eliminates need for painting or makeshift blinds.

Specify Mississippi Glass to your architect, builder or contractor. Available in a wide variety of patterns and surface finishes, all scientifically designed to distribute light to best advantage.

MISSISSIPPI *Glass* COMPANY

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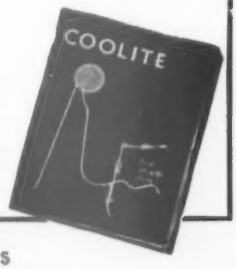
SEE HOW COOLITE CAN SAVE MONEY FOR YOU

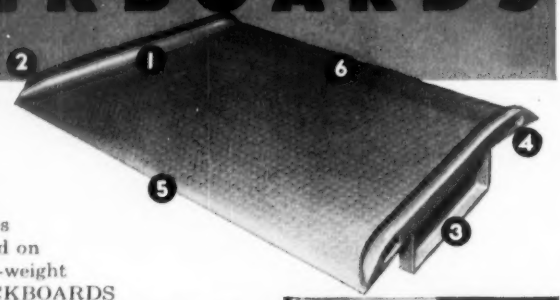
If your are modernizing existing facilities or constructing new ones, include Coolite Glass in your plans. Its cool, blue-green color adds a modern note to any exterior. Coolite's filtered light can provide increased efficiency ond economy, boost employee morale and reduce rejects. See your Mississippi Glass distributor today.

Send for free Coolite Catalog, "Coolite Heat Absorbing and Glare Reducing Glass." Samples on request.



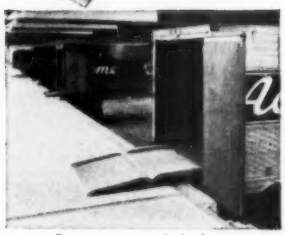
WORLD'S LARGEST MANUFACTURER OF ROLLED FIGURED AND WIRED GLASS

Here's Why Leading Companies Prefer MAGCOA *light-weight* HEAVY-DUTY DOCKBOARDS



Here are six good reasons why many of America's leading companies have standardized on MAGCOA Light-weight Magnesium DOCKBOARDS for use in *all* plants—six important advantages that only MAGCOA can offer you.

1. **Quarter-round safety curbs deflect wheels, prevent run-offs, prolong tire-life; are low for equipment clearance**
2. **Rounded curb ends for safer, easier, tire-saving turns**
3. **Rugged, bridge-built safety spans—individually engineered for extra strength and elimination of dangerous slipping**
4. **One-piece, weather-sealed hand-holds, molded to fit the hand—for complete safety in lifting and positioning**
5. **Special rounded edge beveling eliminates jars without sacrificing strength—saves tires, equipment and loads**
6. **Individually engineered crown keeps edges flush with floors**



For use on truck docks

. . . at railroad sidings or *wherever material is moved*

Light-weight HEAVY-DUTY Magnesium Construction
Lightness, coupled with ruggedness, is another Magcoa Dockboard feature that assures you of quicker, safer, easier handling . . . as it has for others. Use the handy coupon to get helpful literature illustrating exclusive Magcoa Dockboard features and other Magcoa materials handling equipment. At the same time, ask for new literature showing how Magcoa's magnesium fabricating experience and facilities can help you improve your products through use of light-weight, heavy-duty magnesium.

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LABOR TURNOVER

Begins on page 233

er issue of management's attitude toward in-plant communication.

NOW, TO SUM UP • It's good news that more and more companies are recognizing the importance of good human relations. But some are falling into the old error of trying to buy it by the pound.

There was once a father who, shopping with his small son, tried every way he could think of to stop the child's loud wails. Toys, candy, and ice cream failed. So did promises, funny faces, and an exasperated spanking. A helpful salesgirl recognized that these were screams of pain rather than frustration and located the open safety pin.

So, while it is tempting to list the components of human relations programs that have succeeded in many companies, the details of the programs have little to do with their success. Name any "employee benefit," including a wage increase or an extra week of paid vacation. There will always be some poor fellow who can present it to his employees in a way that virtually assures a protest strike.

If management's intentions toward its employees are based on hostility or contempt, any recommendations on human relations can best be addressed to the stockholders. But much constructive work can be done by and with a management that is well-intentioned but somehow inept at showing it.

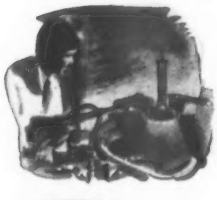
The essence of human relations, of course, is that management does something *with* employees, not *to* or *for* them. And the intent is infinitely superior to the action. An open safety pin may be a bit too much, but employees will cheerfully put up with decidedly second-rate working conditions if they have reason to know that management understands the problem, wants to do something about it, and intends to do something about it.

The time to stop a quit is the moment an applicant walks in.

Mark this down in your book...

This GENERATOR can save up to 50% of your OXYGEN costs

For Metal Production and Fabricating



For Glass Welding and Sealing, etc.

For Chemical Processing, etc.

W&D 1-4213

FIRST UNIT OF ITS KIND—A PIONEER

The JOY Oxygen Generator was designed to supply commercial users of oxygen at actual savings up to 50%. It is an *exclusive* Joy development. The Model OX-20, illustrated, is rated to deliver 2000 cu. ft. per hour (about 2 tons per day). The complete line will include units ranging from ½ to 12 tons capacity daily of oxygen at 99.5+% purity.

OWN YOUR OWN OXYGEN PLANT

All the advantages of the Joy Generator become *yours.* It is simple to start and operate, can be easily handled by ordinary plant equipment personnel and is completely automatic in operation, requiring only occasional inspection and purity checks. What's more, the unit is *inherently safe*—along with a top operating pressure of only 185 psi, it has pop safety valves and an automatic shut-off system.

NO MESSY CHEMICALS

Joy "OX" machines are readily adaptable to single or multiple installations; and for feeding plant supply lines, filling cylinders, or both. The only raw material used is *air,* and the units are self-cleaning . . . no messy chemicals to supply, no residue to remove. ● Write us your oxygen requirements . . . *Joy Manufacturing Company, Oliver Bldg., Pittsburgh, 22, Pa.*

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SPECIALISTS IN THE COMPRESSION AND MOVEMENT OF AIR AND GASES SINCE 1885

WHAT *Life-Line* REALLY DELIVERS IS MORE SERVICE... LESS SERVICING

What *Life-Lines* really deliver is

...more service
...less servicing

"We can't afford equipment breakdowns. We manufacture ice cream making machinery and operate franchise stores throughout the country. Store operators know very little about maintenance. We *must* select equipment that assures trouble-free performance with minimum maintenance. That's what Life-Lines give us. That's why we standardize on them."

The above statement by the chief engineer of an eastern manufacturing plant tells the Life-Line story best. Summed up it means more service, less servicing, with Life-Lines.

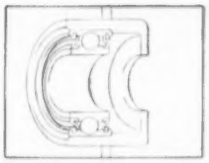
Take the Life-Linestarter, for example. Contacts last longer because exclusive "De-ion®" arc extinction snuffs out arcs fast . . . reduces contact pitting. Simple seesaw balance of clapper prevents accidental opening; kickout spring prevents accidental closing. Compare with any other starter and see why Life-Linestarters offer *more service with less servicing.*

The Life-Line motor's advance design completely eliminates periodic lubrication. Pre-lubricated factory-sealed ball bearings need no greasing attention. Further, steel construction cuts breakage from rough usage. Superior insulation and winding techniques lengthen electrical life. On-the-job reports of a half million Life-Lines show why you get more service with less servicing.

It costs no more to get Life-Line performance. Ask your Westinghouse representative for details or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

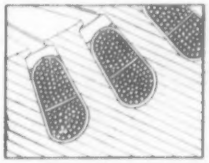
J-21684-A

YOU CAN BE SURE...IF IT'S
Westinghouse



MOTOR

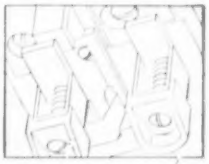
Needs no lubrication. Pre-lubricated factory-sealed bearings eliminate troubles due to under or overlubrication, dust and dirt.



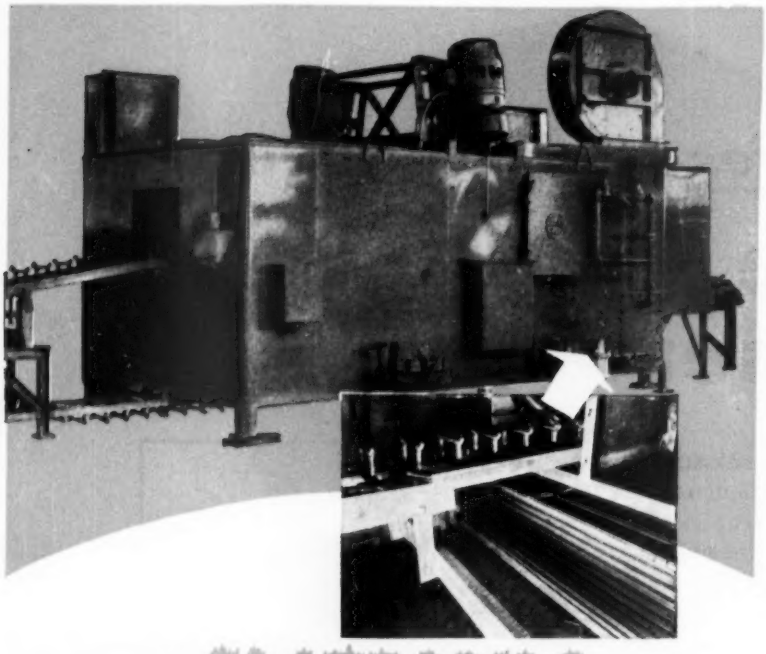
Cuts winding burnouts. Pear-shaped slot design eliminates pockets. No corner voids remain to collect dirt, moisture.

STARTER

Never Jams. No sliding surfaces to wear—no sticking—no jamming—nothing to wear or replace.



Never needs filing. Silver-to-silver contacts eliminate filing. Discolored silver maintains high conductivity.



use of PLATECOILS gives CENTRI-SPRAY WASHING MACHINES construction and sales advantages

In building several of these motor block washers for a large automobile manufacturer, Centri-Spray, Inc., Detroit, Michigan has found that the use of Platecoils has 6 important advantages.

1 **Higher heat input per cubic foot for quicker heat-up.**

2 **Easier installation with Platecoil banks.**

3 **At least 90% of threaded pipe joints eliminated to reduce leakage problems.**

4 **Longer service without cleaning.**

5 **Less condensate trapping in Platecoil bank as compared with serpentine pipe coil.**

6 **No wire cutting in return bends through much lower steam and condensate velocity.**

A bank of three 18 x 83 Platecoils is used instead of a pipe coil consisting of 42 pieces of one inch pipe 85" long, and two pieces 87" long. In addition 44 return bends were needed plus the straps and separate tie bars required. Use of the Platecoils not only simplifies fabrication for Centri-Spray, but it also gives their customer a more efficient, dependable washer.

Why not investigate using Platecoils in your products? You will find, as other manufacturers have, that Platecoils save time in estimating . . . that Platecoils save time and labor in fabrication . . . and that customers are better satisfied with Platecoil performance. ***Write today for Bulletin P60.***

Use the coupon on page 146 or 252 to get these important . . .

Free NEW CATALOGS

Begins on page 146

AIR HANDLING

8 Air Cleaners
You get the story on a line of electronic air cleaners in this 12-page catalog (No. E-60). Describes principles and features of equipment operation. Specifications, applications, and installation data. Trion, Inc.

9 Dehumidifiers
This 32-page catalog tells how to use maker's dehumidifier units to control humidity in large industrial buildings. Gives construction details, selection and engineering data. Useful charts and tables. Catalog No. 1660. Westinghouse Electric Corp.

MATERIALS HANDLING

10 Tramrail Equipment
Here are the details on a line of tramrail systems, tramrail cranes, and transfer bridges. Engineering data on track. Advantages and applications included 8 pages. Bulletin No. 103. The Forker Corp.

11 Boxes & Platforms
Materials handling boxes and platforms are illustrated and described in this 14-page catalog. Engineering data and application information for the steel equipment. Catalog No. P-20. Truscon Steel Co.

12 Fork Truck
In this 4-page folder are features and specifications for a new model fork truck. Specs, dimensioned drawings, and applications. Describes aisle space savings possible with this model truck. Bulletin No. 90-156. Lewis-Shepard Products, Inc.

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CIRCULAR HEADS WITH TIE RODS
SQUARE HEADS WITH TIE RODS
SPACE SAVED
T-J SPACEMAKER . . . provides additional room for adjacent equipment without sacrificing strength.

- SAVES UP TO 40% SPACE WITH NEW STREAMLINED DESIGN.
- SUPER STRENGTH . . . EXTRA HIGH SAFETY FACTOR.
- SOLID STEEL HEADS.
- HEAVY WALL, PRECISION HONED, HARD CHROME PLATED SEAMLESS STEEL BODY.
- LEAKPROOF CYLINDER HEAD TO BODY CONSTRUCTION.
- RELATIVE PORT POSITIONS MAY BE ROTATED WITHOUT DISASSEMBLY OF CYLINDER AND LOCKED IN DESIRED POSITION.
- HEAVY DUTY, HI- TENSILE, HARD CHROME PLATED PISTON ROD.

Streamlined construction of the new T-J Cylinders *eliminates tie rods . . . reduces head size . . .* and *saves up to 40% in mounting space!* In addition, a new high in strength is achieved with solid steel heads and heavy wall seamless steel body . . . leakproof construction . . . extra high safety factor.

Cylinder walls are precision honed and hard chrome plated for long-life efficiency. Available with the new T-J Super Cushion Flexible Seals which insure positive cushion with automatic valve action for fast return stroke. Many standard sizes and styles . . . both cushioned and non-cushioned . . . for wide range of pushing, pulling, lifting, clamping or control jobs. T-J dependability. *Fast delivery* to meet rush requirements. Write for bulletin 8152. The Tomkins-Johnson Co., Jackson, Mich.

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ELECTRICAL EQUIPMENT

13 Sound-Powered Phones
This folder (No. SA-25) covers sound-powered communications equipment for industrial use. Includes information on a variety of systems, together with a listing of special equipment. Features, specs, and prices. Wheeler Insulated Wire Co.

14 Wiring Equipment
120-page pocket-size catalog and wiring guide has complete information on maker's surface metal raceways and fittings for electric light, power, and telephone. Index, product illustrations, and useful data. Catalog No. 19. The Wiremold Co.

15 Hook-On Instruments
Features, application hints, and operating data are features of this 8-page catalog on a line of hook-on instruments. Characteristics and price list included for each item: volt ammeter, wattmeter, and power-factor meter. Catalog No. GEC-901. General Electric Co.

16 Circuit Breakers
Manual No. 101 explains operating principles of basic circuit breaker designs, and provides engineering data on applications. Included are diagrams showing three basic types of equipment. Heinemann Electric Co.

17 Glass-Jar Batteries
You learn in this 20-page catalog how to select and install the proper glass-jar batteries. Tells how to use them in control, alarm, telephone, switchgear, and signalling devices. Features, specs, dimensions, and technical data. Gould-National Batteries, Inc.

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Complete matched control for any motor, including manual and magnetic starters, pushbuttons, and variable speed control.

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Standard open drip-proof, splash-proof, totally-enclosed, fan-cooled and explosion-proof, ½ hp and up. Also wound rotor and direct current. Special motors to meet your requirements.

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18 Cable Trough
Here's a 12-page catalog on standard cable trough designed for easy-to-erect sturdy raceways of varying width. Tells when to use it and how, describes what's available, and gives features and engineering data. Bulletin No. 65A. T. J. Cope, Inc.

BUILDINGS

19 Steel Shop Equipment
Steel workbenches, cabinet benches, and multiple-unit benches with cabinet and section for storage are subjects of this 4-page folder. Illustrations, specifications, and application information. Bulletin No. 839. Standard Pressed Steel Co.

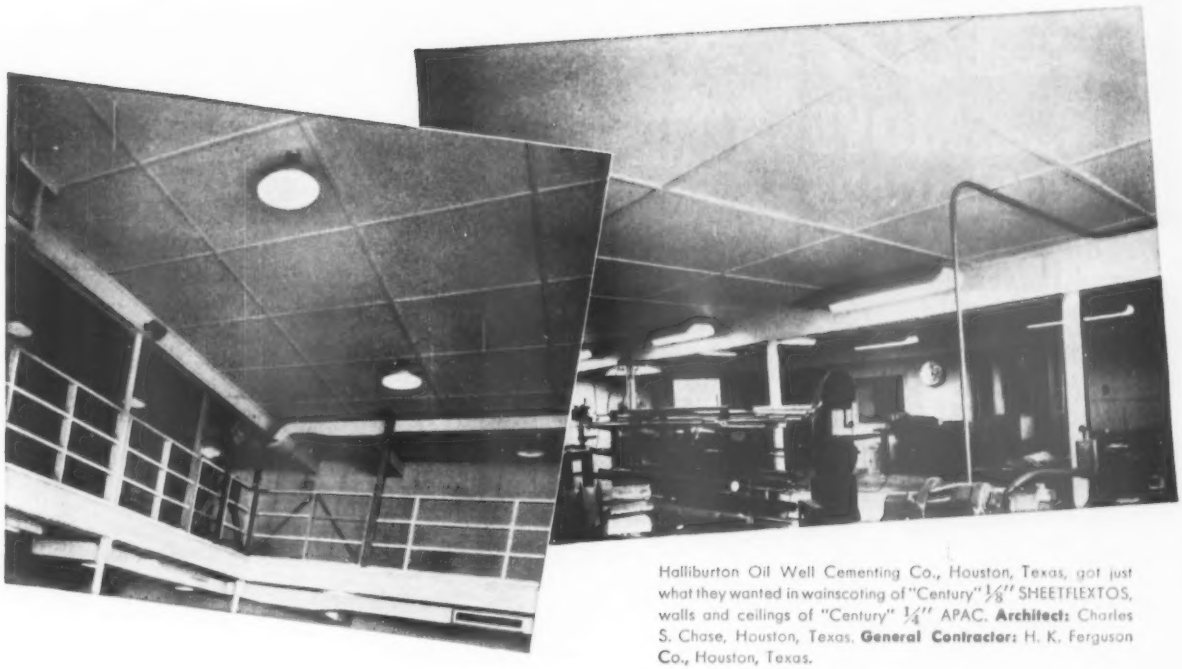
20 Safety Treads
File folder contains 28 sheets of details on abrasive cast and safe groove treads. Also expansion plates, platforms, curb bars, and floor grids. Product cross sections, specs. Wooster Products, Inc.

PROTECTIVE COATINGS

21 Protective Coating
This folder spotlights a newly-developed acid-and-alkali-resistant coating designed for ceiling, floors, walls, and equipment. Gives properties, tells about surface preparation. Barreled Sunlight Paint Co.

22 Protective Coating
Bulletin No. 730 tells where and where not, how and how not to use maker's paint and primer. Gives chemical resistance charts and data on recommended primers and surface treatments. U. S. Stoneware Co.

Turn the page



Halliburton Oil Well Cementing Co., Houston, Texas, got just what they wanted in wainscoting of "Century" 1/8" SHEETFLEXTOS, walls and ceilings of "Century" 1/4" APAC. **Architect:** Charles S. Chase, Houston, Texas. **General Contractor:** H. K. Ferguson Co., Houston, Texas.

Walls without worries

. . . ceiling without overhead

with **"CENTURY"**

ASBESTOS-CEMENT SHEETS

Halliburton Oil Well Cementing Co. wanted strong, good-looking walls and ceilings that would be *fire-resistant* and *easy to clean*. That's why they chose "Century" SHEETFLEXTOS for wainscoting applied over solid sheathing and "Century" APAC secured right to studs and joists for upper walls and ceilings.

Fire-resistance, of course, is an outstanding feature of these structural boards, combined as they are of virtually indestructible asbestos fiber and portland cement. Ease of cleaning, too, comes "naturally" to their hard, smoothly-textured surfaces that can't be hurt by water, dampness, or rot, and need no protective painting.

But look at the *extra* features that go with "Century" APAC and SHEETFLEXTOS. Both Sheets are also resistant to rodents, immune to termites. They go on fast, in big sheets (standard 4′ x 8′) that can be cut or drilled on the job, and fastened easily with screws or ring-fettered nails. They obviate the need for laths and plaster, and, while they require no painting at all, they take decorative colors well. SHEETFLEXTOS, as its name implies, has the added advantage of flexibility, to make curves and domes where indicated.

Both "Century" APAC and "Century" SHEET-FLEXTOS make good surroundings for successful work and enjoyable living. Figure on one or both for your attractive, fire-resistant interiors. Write us for further details about these economical products . . . and name of your nearest distributor.

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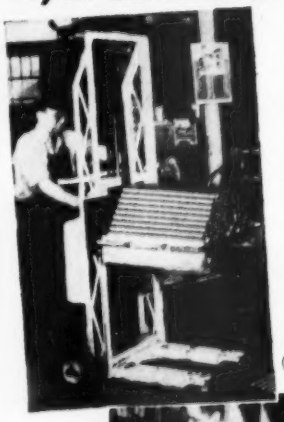

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IMPORTANT NEW Free CATALOGS

Begins on page 146

MISCELLANEOUS

23 Precision Bronze Bars, Bearings
Catalog No. 52 gives you 72 pages on standard bronze stock bearings, precision bars, and electric motor bearings. Product illustrations and size listings. Engineering data section. The Bunting Brass & Bronze Co.

24 Fasteners
In this 12-page catalog you learn how company can help you solve your fastener problems with its products and know-how. Describes engineering services available, tells how you can get the fastener to meet your needs. Catalog No. MM 52. The Milford Rivet & Machine Co.

25 Vises
Vises for a variety of plant uses are shown in this 34-page catalog. Features, specifications, and illustrations. Section on work positioners. Application information included. Catalog No. 108W. Wilton Tool Mfg. Co.

26 Induction Heaters
Data on 60-cycle, low-frequency induction heaters in this 8-page catalog. Information includes rating and dimension tables, and illustrations of the equipment. Form No. 1052. Magnethermic Corp.

27 Plastic Products
Here's an 8-page catalog on a plastic available as pipe moldings, extrusions, and fabrications. Describes properties, gives available sizes, and suggests applications. Form No. NY-2260. New York Belting & Packing Co.

28 Maintenance Inspection Equipment
This 4-page folder tells how you can use portable non-destructive inspection equipment in your plant. Describes methods and equipment, outlines savings. Form No. 149. Magnaflux Corp.

For catalogs 29 through 46 see Plant Engineering Problems, page 146, and Plant Operating Problems, page 252.

DUPLICATE COUPON ON PAGE 146

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FACTORY MANAGEMENT & MAINTENANCE (January, 1953)
330 W. 42nd St., New York 36

I'm circling the numbers of the catalogs and bulletins I want:

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The Buckaroo—Air Force Trainer Built by Temco.

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The Acme Flow-Cold Packaged Unit was selected because it was compact, easily installed, and assured pre-tested performance. *It was so successful a second unit has since been installed along with an Acme Cooling Tower.*

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Evaporative Condensers
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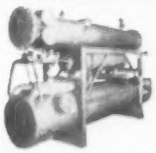

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Convectors for Heating and Cooling

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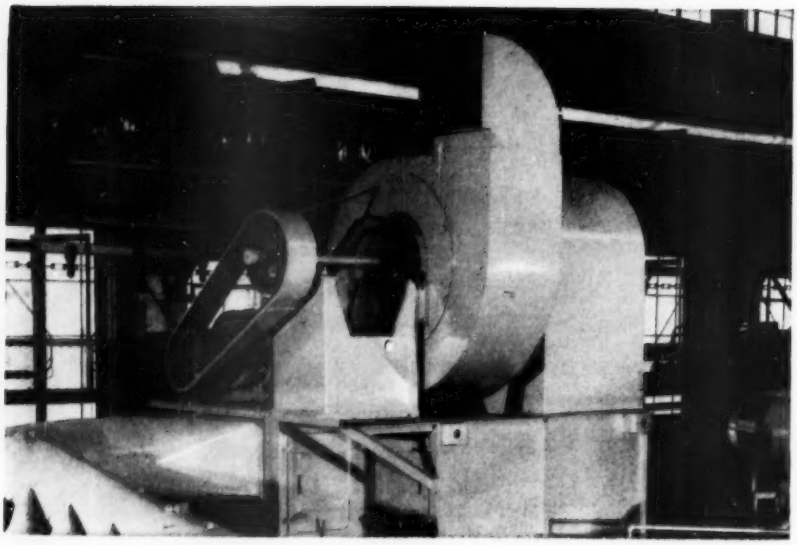

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These twelve fans operate in connection with twelve American Air Filter Company's Roto-Clone installations.

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Good Ways to Solve Special

PLANT ENGINEERING PROBLEMS

You can get catalogs suggested as answers to these problems by using coupon on page 146 or 252.

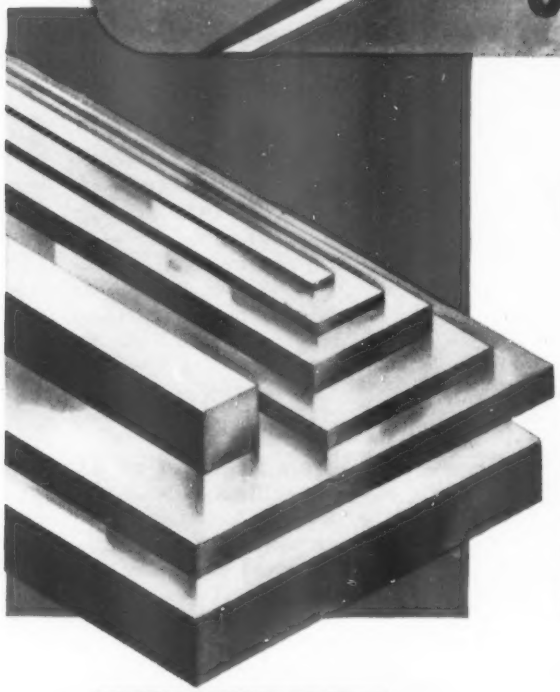
CAN'T GET THAT BLASTED MACHINE APART? Save time in chipping away metal defects or opening joints by using an Arcair torch to cut or gouge. Operates on ordinary DC welding machine with compressed air. (*Circle No. 29 on coupon, page 146 or 252.*)

WHEN YOUR GAS BURNERS NEED QUICK ADJUSTMENT to operate efficiently on any type of gas, look over the Eclipse Vari-Set mixer. You get the exact mixture you want without dismantling of mixer, pipes, or burner equipment. Bulletin No. L-700. (*Circle No. 30 on coupon, page 146 or 252.*)

IF MOISTURE IS YOUR PROBLEM, Selas says its Dehydrator can squeeze it out to any limit you want. Bulletin SC-1013 shows how water vapor can be continuously removed from air and other gases to improve product quality and eliminate danger of condensation, freeze-ups, and corrosion. (*Circle No. 31 on coupon, page 146 or 252.*)

HOW TO DAMPEN PULSATION IN YOUR AIR COMPRESSOR LINE: The PPC Aircheck valve will do the trick, claims Pennsylvania Pump & Compressor Co. Easy to install, and immediately accessible without disconnecting piping. Bulletin No. 509A. (*Circle No. 32 on coupon, page 146 or 252.*)

TO MAKE ANY PLANT CLEANING JOB EASIER, consider chemical conditioner PN-700, made by Service Industries. For example, its penetrating power simplifies cleaning of filters, coils, and reservoir of your air conditioning sys-



SIMONDS

Now Makes Both Types of Flat Ground DIE STEEL

Simonds offers you a choice of OIL or AIR Hardening DIE STEEL, whichever is best suited to your requirements. Both types are made from Simonds own steel, are precision ground to a thickness limit of plus or minus .001" and have an extra smooth surface finish of 25 to 35 micro inches. Edges and ends are square and parallel, with all scale, decarburation and surface defects removed. All sizes come individually packaged with heat treating instructions.

SIMONDS AIR HARDENING DIE STEEL

(non-deforming 5% Chrome Type) is spherodize annealed for good machinability and uniform hardenability. Its wide hardening range (1700° to 1800° F.) makes it practically foolproof in heat-treating. Stock sizes run from ½" to 2" thick and 2" to 10" wide in 36" lengths.

SIMONDS OIL HARDENING DIE STEEL

(non-deforming Molybdenum Type) is uniformly annealed for easy machining and uniform hardening. Due to its wide hardening range (1450° to 1540°) good results are assured with even the simplest heat treating equipment. Stock sizes are available from 1/16" to 3" thick and 1/8" to 14" wide in 18" lengths. The heavier sizes also come in 36" lengths.

Try a bar on your next job. Your Simonds Distributor carries many sizes of both types in stock — call him right now.

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• MORE NEOPRENE IN THE PROTECTING JACKET! It is Certified to contain not less than 60% by weight of new Neoprene. This ...INCREASES SAFETY MARGIN, INCREASES RESISTANCE, INCREASES SERVICE LIFE!
• LONGER-LASTING COLD RUBBER INSULATION!
• GREATER FLEXIBILITY!—engineered, rope-like flexibility.
• MORE CONVENIENCE! Jackets are branded with full identifying data. Coils are packaged in neat shelf cartons.
Bears symbol "P116BM," flameproof registration number of the U. S. and Pennsylvania Bureaus of Mines.
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ELECTRICAL WHOLESALERS DISTRIBUTORS
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Bronco 60 Certified is an Achievement of
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LOS ANGELES 58, CALIFORNIA

Begins on page 254

Good Ways to Solve Special

PLANT ENGINEERING PROBLEMS

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tem. Contains no caustic, acids, abrasives, or irritating chemicals. It's non-toxic. (*Circle No. 33 on coupon, page 146 or 252.*)

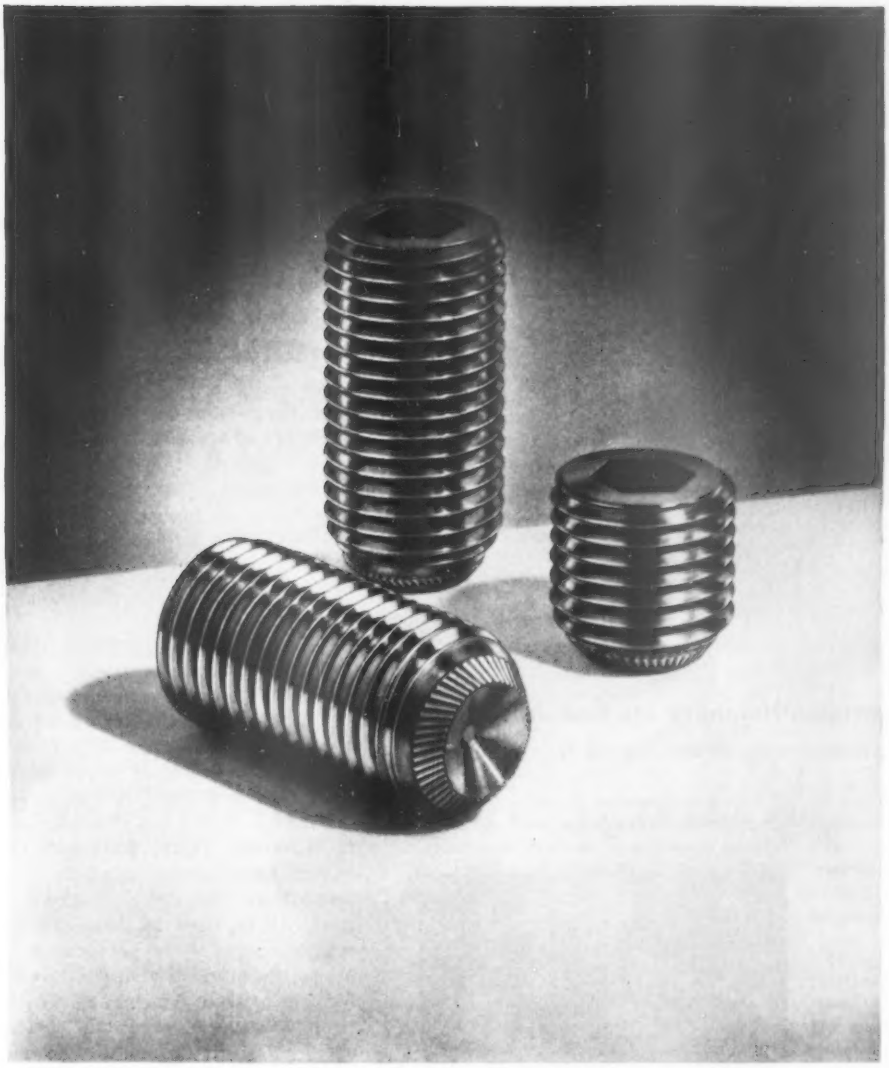
MAYBE A DOCK BUMPER WILL SOFTEN YOUR BUMPING ACCIDENTS. Durable Mat Co. thinks so. Its rubber dock bumpers will outlast wood several times, and can be installed easily. No maintenance required, according to bulletin. (*Circle No. 34 on coupon, page 146 or 252.*)

WHEN PROCESS ABRASIVES WEAR OUT EQUIPMENT, it's time to line with Linatex, warns Linatex Corp. of America. You can easily apply this natural rubber material to pumps, scoops, chutes, fans, ducts, and pipelines. It's completely resistant to moisture, also resists tearing (*Circle No. 35 on coupon, page 146 or 252.*)

NEED A HANDBOOK ON HARD-FACING? Stoody Co.'s 48-page "Hard-Facing Guidebook" tells you how to rebuild and hard-face your plant equipment with various alloys. (*Circle No. 36 on coupon, page 146 or 252.*)

TO CUT COST OF WASHING DOWN PLANT WALLS BY HAND, try a Ross & Story chemical wall-washing machine. This non-electric, portable machine feeds only clean chemical solution and rinse water to wall and ceiling surfaces. And without dripping and splashing. Works on all types of ceilings and walls, according to Bulletin No. WW-652. (*Circle No. 37 on coupon, page 146 or 252.*)

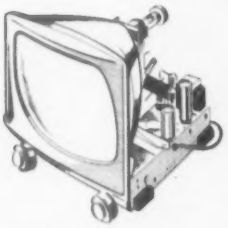
Turn the page



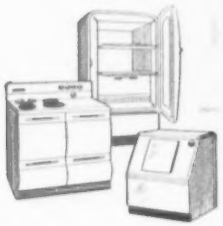
UNBRAKO SELF-LOCKING SOCKET SET SCREWS feature the following advantages: knurled cup point that won't work loose; accurate hex socket for nonslip, positive drive; fully formed threads—Class 3 fit; heat treated alloy steel for strength; standard sizes—#4 to 1"—in a full range of lengths.

Our Fiftieth Year

A START FOR THE FUTURE



USE UNBRAKO SELF-LOCKING SOCKET SET SCREWS wherever ordinary cup point set screws are used . . . on radios, television sets, electronic equipment.



On refrigerators, washing machines, and other household appliances.

On power mowers, power saws and other power tools.

9 times out of 10 a standard UNBRAKO will do the job

A special socket screw may not be necessary, a standard UNBRAKO usually does the same job—much cheaper. Your local industrial distributor stocks Standards. He gives immediate attention to your requirements, and such extras as special delivery to your plant. Write for UNBRAKO Standards. SPS, Jenkintown 11, Pa.

Write for UNBRAKO Standards

UNBRAKO® SOCKET SCREW DIVISION

SPS JENKINTOWN PENNSYLVANIA

Niagara's HYGROL DRIES AIR BEST

with exact moisture content

- to control your product's quality
- to prevent condensation on your product or material
- to prevent changes due to moist air in contact with your product
- to protect your material from dampness
- to protect your processing of moisture-sensitive material
- to DRY your material or product
- to pack or store your product safe from moisture damage
- to get exact moisture control for the precise atmosphere condition you need
- to provide precise atmospheric conditions for testing
- to increase your air conditioning capacity
- to DRY large quantities of fresh air from outdoors

The Niagara's Controlled Humidity Method using HYGROL moisture-absorbent liquid is

Best and most effective because . . . it removes moisture as a separate function from cooling or heating and so gives a precise result constantly and always. Niagara machines using liquid contact means of drying air have given over 20 years of service.

Most reliable because . . . the absorbent is continuously reconcentrated automatically. No moisture-sensitive instruments are required to control your conditions.

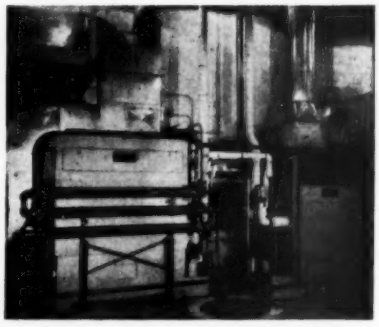
Most flexible because . . . you can obtain any condition at will and hold it as long as you wish in either continuous production, testing or storage.

Easiest to take care of because . . . the apparatus is simple, parts are accessible, controls are trustworthy.

Most compact, taking less space for installation.

Inexpensive to operate because . . . no re-heat is needed to obtain the relative humidity you wish in normal temperature ranges and frequently no refrigeration is used to remove moisture.

The cleanest because . . . no solids, salts or solutions of solids are used and there are no corrosive or reactive substances.



Niagara Controlled Humidity Air Conditioning

This method removes moisture from air by contact with a liquid in a small spray chamber. The liquid spray contact temperature and the absorbent concentration, factors that are easily and positively controlled, determine exactly the amount of moisture remaining in the leaving air. Heating or cooling is done as a separate function.

For complete information write

NIAGARA BLOWER COMPANY

Dept. F, 405 Lexington Ave., New York 17, N. Y.

District Engineers in Principal Cities of United States and Canada

Good Ways to Solve Special PLANT ▶ OPERATING PROBLEMS

You can get catalogs suggested as answers to these problems by using coupon on page 146 or 252.

FOR FREE TIPS ON FABRICATING TYPE 430 STAINLESS STEEL, take a peek at Sharon Steel Corp.'s booklet on the subject. You get the low-down on forming and bending, spinning, soldering, and machining operations. (*Circle No. 38 on coupon, page 146 or 252.*)

NEED SPECIAL MACHINES FOR HIGH PRODUCTION? Both special and standard machines are described in Ex-Cell-O Corp.'s general products catalog No. 27312. 32 pages. (*Circle No. 39 on coupon, page 146 or 252.*)

IS JOINING YOUR BOTTLENECK? Maybe Electropunch can help. It's an all-electric impact hammer that can be used to stake, rivet, mark, swage — or perform any other operations where a sharp blow is needed. And at speeds up to 10,000 pieces per hour. Data sheet tells all. (*Circle No. 40 on coupon, page 146 or 252.*)

CAN YOU HOLD YOUR JOBS? DoAll Universal Clamps make the task lots easier, claims The DoAll Co. They're adaptable to any kind of work holding problem. They'll even hold irregularly shaped pieces over a wide range of sizes without use of shims, pads, or step-blocks, according to Bulletin No. 51-809 (*Circle No. 41 on coupon, page 146 or 252.*)

TO PUT YOUR QUALITY UNDER A MICROSCOPE, try an optical instrument built to meet your control needs. Bausch & Lomb Optical Co. describes the use of a complete line of contour measuring projectors, stereomicroscopes, thickness gages, and other instru-

Trumbull Top Quality Features
AT 'TYPE C' PRICE

If your safety switch requirements call for normal usage and load conditions, your Trumbull wholesaler can show you a new high in value.

Check the factors that are important to you — complete safety, rapid wire-in, simplified service, compactness. You'll find them all in this new, completely Underwriters' Laboratories Approved switch line.

Inspect the pole units, the heart of any switch. They are identical with the advanced quick-break, arc-quenching design used in Trumbull heavy duty HCI switches. Notice that all current carrying parts are silver plated. Try the positive ON-OFF action. Look at the sturdy enclosure with full overlapping cover flange.

Here's assured safety and dependability in a quality switch at a price which spells economy in your purchasing . . . without resorting to "off-brand" substitutes.

Leading Electrical Distributors everywhere stock Trumbull equipment. See your local Trumbull Distributor for top values and alert service. For complete descriptive literature, write us.

Quick Facts . . .

About Style HCI Side Operated Standard Duty Service Switches

CAPACITIES: 30, 60, 100 and 200 amp., including 2- and 3-pole, 3- and 4-pole (solid neutral), and 4-pole in 30 through 100 amp., fusible and no fuse; 240, 480 and 600 volt A.C., 250 and 600 volt D.C. . . . all H.P. rated. Meets NEMA Type A Specifications.

SAFETY FEATURES: Provision for padlocking enclosure catch and handle in either position. Clear ON-OFF marking on cover and interior.

MOUNTING: Unusually compact. Can be closely ganged (200 amp. switch requires only 4½" between sides). Ring handle can be hook stick-operated if in high mounting.

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DEPARTMENT OF GENERAL ELECTRIC COMPANY
PLAINVILLE, CONN.

Control Costs with TOLEDO

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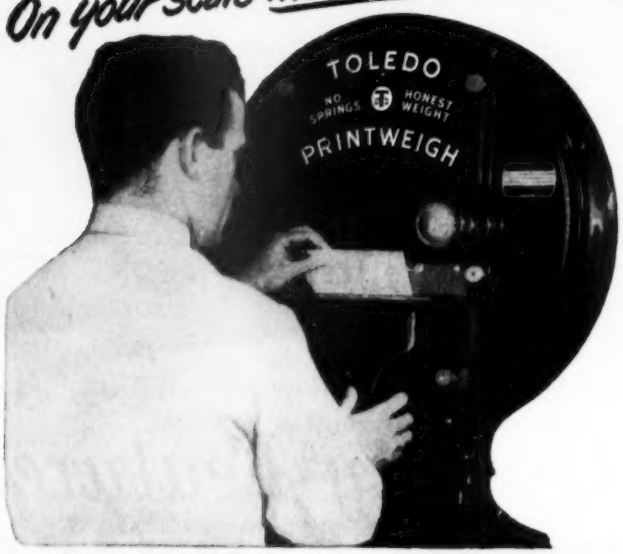

PRINTWEIGH STOPS ERRORS . . . Provides printed weight records—at the instant of weighing—assuring that the accurate indication of the Toledo dial will reach your accounting records without chance of human error.

Modern Toledos meet your needs today for *rapid, accurate* scales in all phases of production . . . to help you *control costs*!

In providing basic production, receiving, stock or shipping information—the scale is doing an accounting job—on the scale! Every time you weigh, material becomes money! That's why today it is more important than ever to KNOW weights are right—every time.

Check your needs *now*—select Toledo equipment for vital jobs in guarding materials and costs . . . in weighing, counting, testing, batching, force-measuring. Sales and service in 200 cities. Toledo Scale Company, Toledo 1, Ohio.

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Over-Under Scales
Three sizes—5 lb., 20 lb., 50 lb. Wide angle reading; choice of platters and scoops. Write for Bulletin 2110J.

TOLEDO®

HEADQUARTERS FOR SCALES

Begins on page 258

Good Ways to Solve Special PLANT ▶ OPERATING PROBLEMS

You can get catalogs suggested as answers to these problems by using coupon on page 146 or 252.

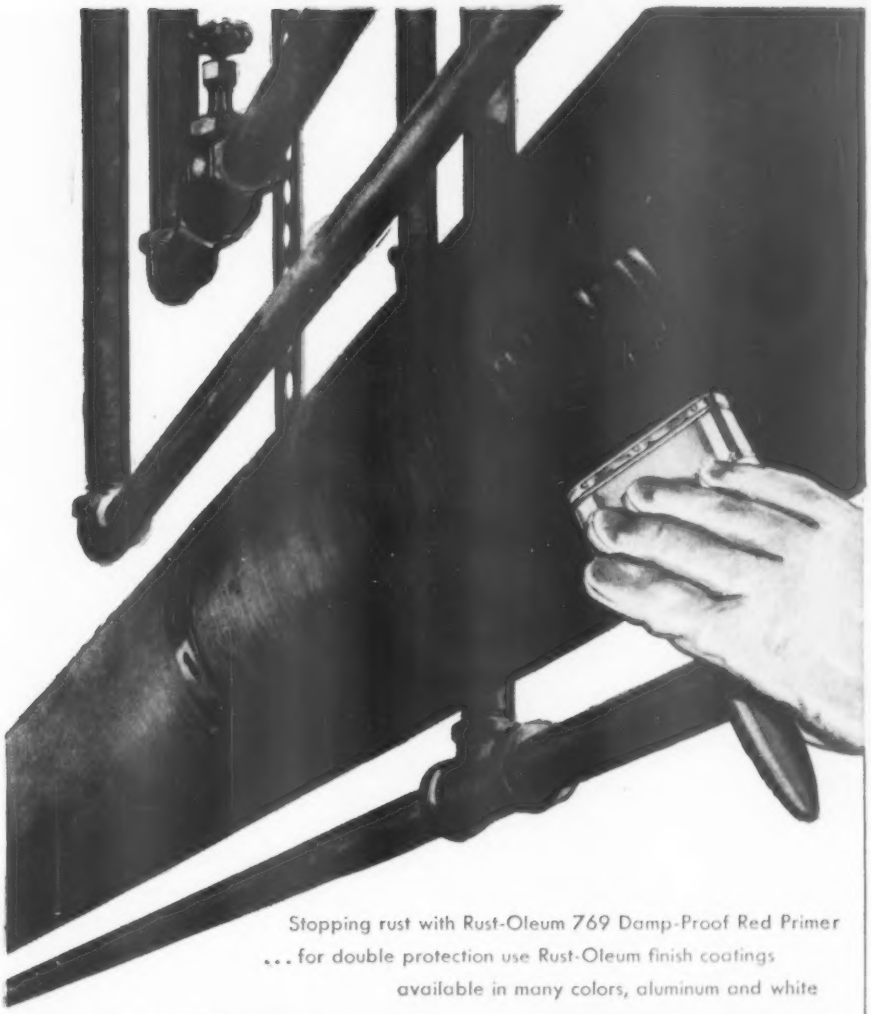
ments. Use them as separate units or build them into present equipment, suggests Catalog No. D-22. (*Circle No. 42 on coupon, page 146 or 252.*)

WHAT COULD YOU DO WITH NEW MACHINE TOOLS? South Bend Lathe Works' Catalog No. 5205 is bound to give you plenty of ideas. Its 88 pages are packed with illustrations and specifications on lathes, shapers, drill presses, attachments and accessories. Tells floor space required. (*Circle No. 43 on coupon, page 146 or 252.*)

WANT TO SEE A GRINDING CHIP? Cincinnati Milling Machine Co. says it has the first pictures ever made of a grinding grit taking a chip. That's only one of the features of Publication No. G-618 on grinding - wheel manufacture. (*Circle No. 44 on coupon, page 146 or 252.*)

FOR FINISHING HOME APPLIANCES, there's a manual that gives you all the facts: Finishes, finishing methods, and equipment. The Glidden Co. says its research and production-line know-how is concentrated in "Nubelite Finishes for Refrigerators and Home Freezers." (*Circle No. 45 on coupon, page 146 or 252.*)

HAVE YOU REVIEWED PACKAGING METHODS LATELY? Maybe plastics will help you do a better job, says Bakelite Co., a Division of Union Carbide & Carbon Corp. Its 1953 guide for improving packaging illustrates applications for plastics and resins. (*Circle No. 46 on coupon, page 146 or 252.*)



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... for double protection use Rust-Oleum finish coatings
available in many colors, aluminum and white

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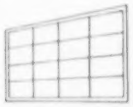
Water tanks, gas tanks, fuel tanks—Rust-Oleum protects your investment.

One truck, or a fleet of trucks, applied over rust, Rust-Oleum keeps them looking better . . . in service longer.



Metal sash and steel windows, roofs, gutters, fire escapes, railings—indoors and out need Rust-Oleum to stop rust.

Wire fence maintenance? Rust-Oleum's Extra-Long Nap Lamb's Wool Roller cuts re-coating costs up to 50% in some cases.

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Rust-Oleum is an *exclusive formula* developed by a Master Mariner during more than 20 years battling actual rust conditions at sea. It incorporates a *specially-processed* fish oil vehicle that will *dry*, is *odor-free*, and is formulated in *many colors*. Be sure you specify genuine Rust-Oleum. Accept no substitute.

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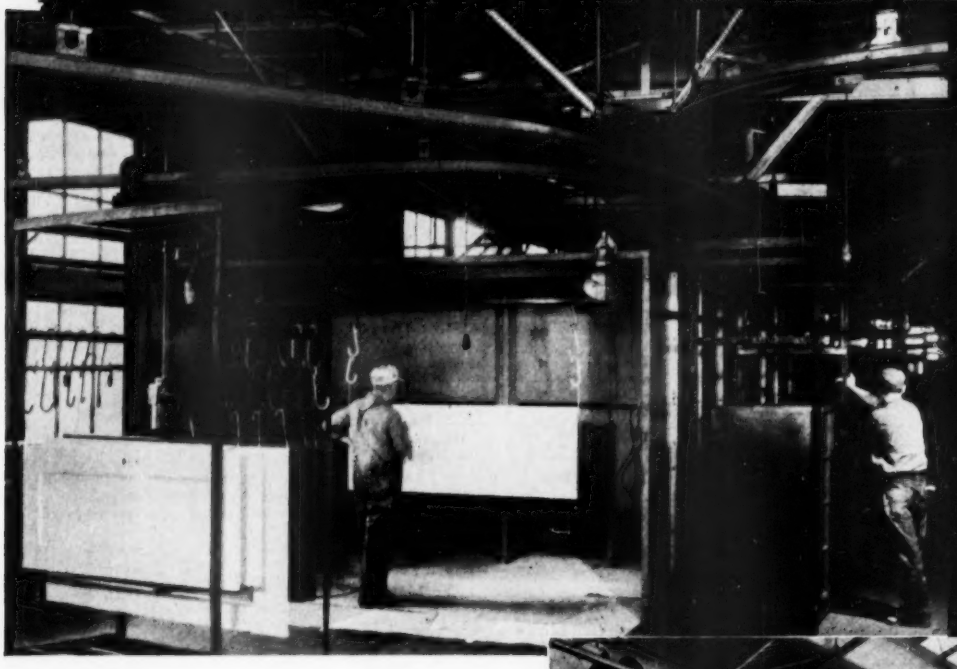
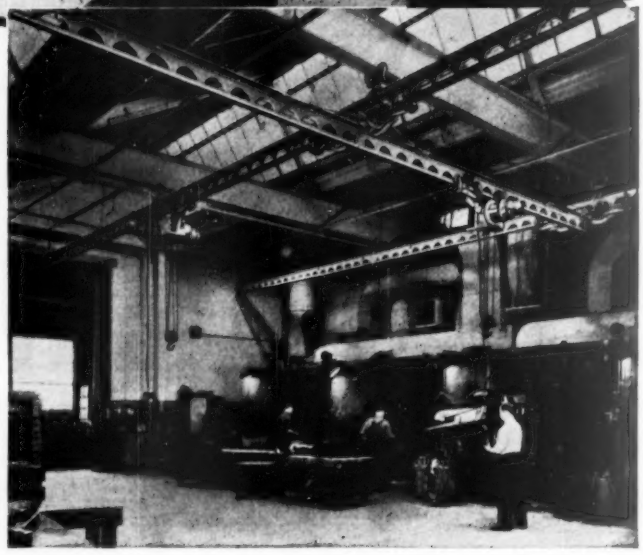
See RUST-OLEUM demonstrated—Booth 1237, Plant Maintenance Show, Cleveland, Ohio

handle freshly painted parts the *EFFICIENT OVERHEAD way*



This rack carrier system speeds the painting of metal doors and filing cabinets. The items are conveyed to and from the spray booth in an even flow without log-jamming.

A three-runway crane simplifies handling of ironing machines and other laundry equipment in this paint room. The middle runway track extends to other parts of the building, enabling loads to be brought directly to the room by the hoist carrier seen at left.



PAINTING and handling parts or complete machines is greatly simplified and speeded by use of an inexpensive Cleveland Tramrail overhead system.

Items may be delivered from fabrication department, painted by spray or dip, and conveyed to assembly or shipping without leaving the tramrail system. Freshly painted pieces are easily moved the overhead way with little danger of being touched or damaged.

Various types of Cleveland Tramrail equipment are available to suit different conditions. Whether it be cranes, rack carrier systems or completely automatic installations, Cleveland Tramrail engineers can advise and serve you.

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BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

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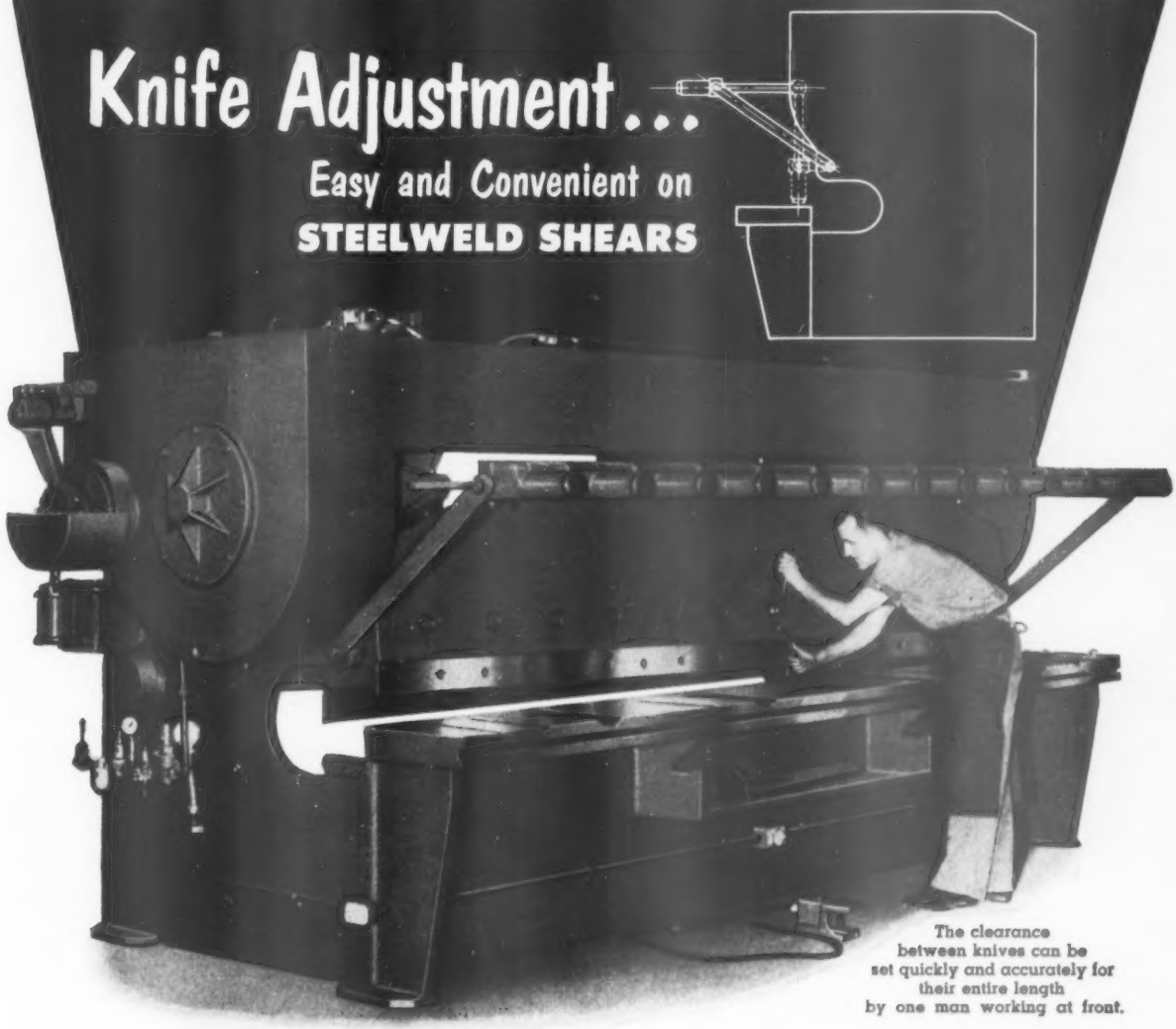
THE CLEVELAND CRANE & ENGINEERING CO.
3208 EAST 284TH ST. WICKLIFFE, OHIO

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

Knife Adjustment...

Easy and Convenient on STEELWELD SHEARS



The clearance between knives can be set quickly and accurately for their entire length by one man working at front.

When the knives on a Steelweld Shear are being set parallel from one end to the other, it is not necessary to have one man at the rear of the machine turning adjustment bolts, with another man at the front gauging the knife clearance. Nor is it necessary to work between or behind the hold-downs in hard-to-reach places.

On Steelwelds the hold-down beam can be lifted out of the way and all knife adjustment bolts reached from the front of the machine. As each bolt is turned, the clearance can be checked at once. One man can make the entire adjustment in a small fraction of the time usually required.

After the knives have been set for parallel, the clearance between them can be adjusted to suit various plate thicknesses to obtain the best possible cuts. This can be done in a few seconds by turning a crank and watching a dial indicator.

Because knife adjustments have been made so convenient on Steelwelds, shear operators will make them gladly and without hesitation. This contributes greatly to accuracy and quality of cuts and assures long knife life.

GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

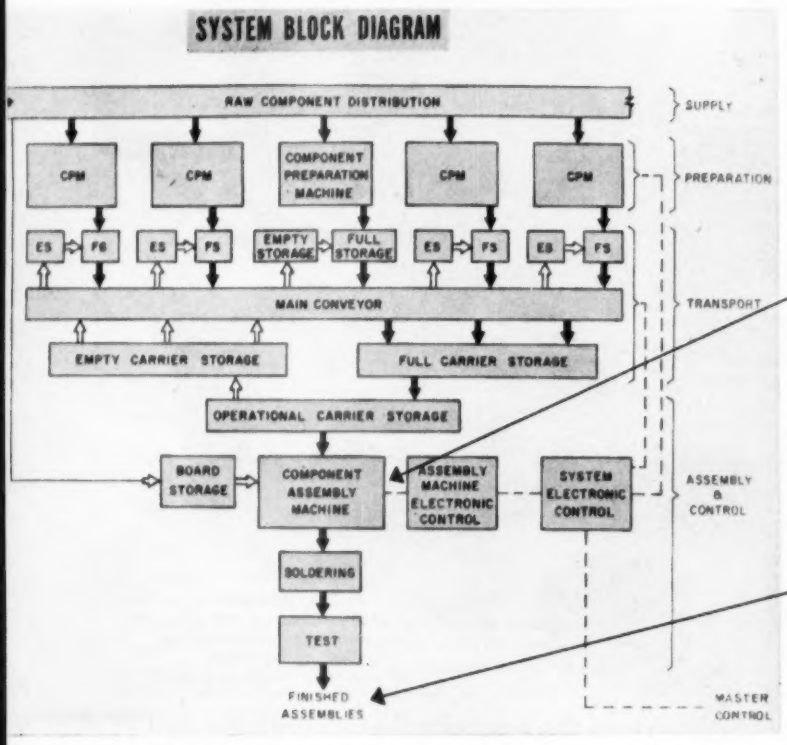
3238 EAST 282 STREET, WICKLIFFE, OHIO.

STEELWELD PIVOTED BLADE SHEARS

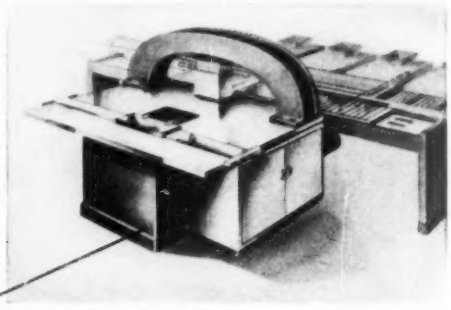
YOU MUSTN'T MISS-

INDUSTRIAL NEWS

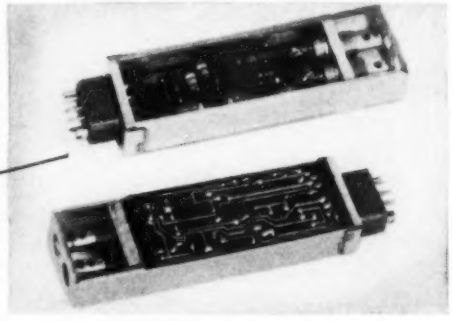
INDUSTRIAL NEWS, BEGINNING ON THIS PAGE
TIMELY HINTS TO BETTER MANAGEMENT ON PAGE 272
QUOTES FROM INDUSTRY'S LEADERS ON PAGE 278
IDEAS TO STIMULATE YOUR THINKING, ON EVERY PAGE



1 Flow chart of the future shows the kind of process planning that goes into integrated sequencing of automatic assembly operations. Starts at top.



2 Machine will spot components in exact position so that leads can plug into plated circuit base.



3 Typical assembly is completed after hot solder dip fastens components securely to the base.

When Electronic Assembly Goes Automatic

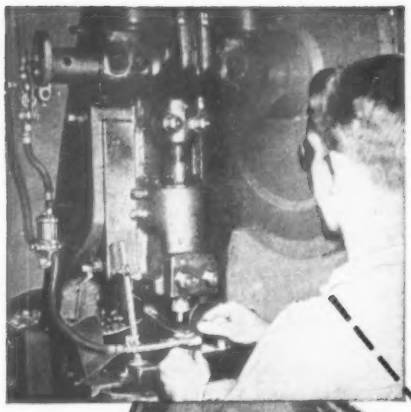
AUTOMATIC ASSEMBLY, one of the toughest problems for the factory of the future, is soon going to be licked—for the electronics industry, anyway. Just about all you'll have to do is load electronic parts into one machine and unload finished assemblies from another.

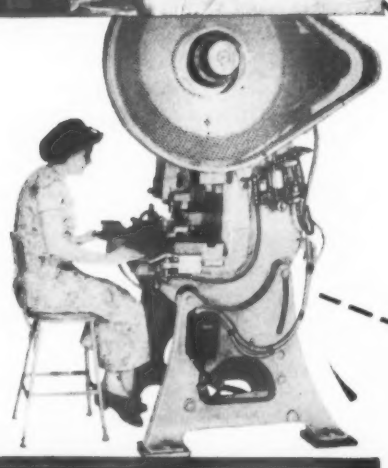
To do the job, three new machines are being developed by General Electric Co. for the Signal Corps. The operation will work this way, according to *Aviation Week*, a McGraw-Hill publication:

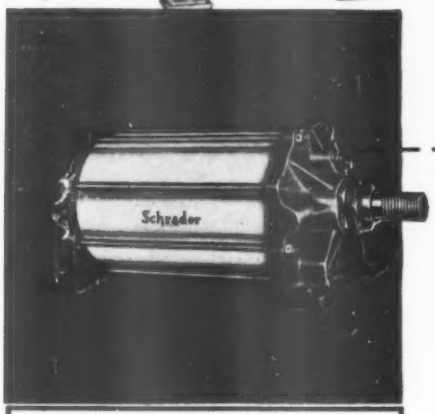
A component preparation machine will test each component electrically, reject defectives, cut and form the leads as required, and deliver the component to the . . .

Component carrier. This device will load components into carrier trays and code the trays for identification. Then it will deliver the trays to the . . .

Component assembly machine (photo 2, above)







Some equipment just naturally boosts production

. . . Schrader Air Controls for instance. *You can't help* getting smoother, faster operations with air power on your side.

The tireless muscles of compressed air lighten labor all along the production line.

● *For ejection of work*, Schrader Air Ejection Sets automatically eject finished parts . . . eliminate tedious hand removal or bulky mechanical devices.

● *On power presses*, press brakes, and any machine using either a friction or mechanical clutch, Schrader Machine Controls promote building a high-speed work rhythm that pays big production dividends with safety.

● *All over the shop*, Schrader Air Cylinders are faithfully on the job, delivering more powerful straight-line forces than any other commonly used power units of equivalent size or weight.

These are only three of the many hundreds of new and improved Schrader Air Control Products that build production and safety in your plant. It's easy to plan their use in many places in your shop. Write, outlining your installation, your idea—or fill out the coupon below.

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products control the air

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An immediate way to realize more production per manhour—and at minimum investment—is by the installation of CM Electric Hoists. By making use of non-productive overhead space you can speed the flow of parts and assemblies... raise employee efficiency levels... reduce fatigue. As anyone can operate these CM Electric Hoists, skilled manpower is released for other production operations. Valuable floor space is made free for added production. Here are two CM electric hoists favored particularly by plant production executives.

CM METEOR Capacities: ½ to 5 tons

Low headroom wire rope electric hoist for heavy duty service. Single and two speed models. Push button control. High efficiency airplane type cooling. Helical gears. Fully enclosed operating parts. Precision bearings at all rotating points. Plain, geared or motor driven trolleys.

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Portable, compact and rugged electric chain hoist. Available in push button and pendant rope control models. Equipped with flexible HERC-ALLOY load chain. Fully enclosed working parts. Upper and lower safety limits. Permanently lubricated. Plug in on 110, 220 or 440 volt power line. Used extensively in production operations.

CM Electric Hoist Catalog sent on request with prices and name of your local CM distributor. Production executives find our catalog a good source of hoist information.

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(Affiliated with Columbus McKinnon Chain Corporation)

GENERAL OFFICES AND FACTORIES: TONAWANDA, N. Y.

SALES OFFICES: New York, Chicago and Cleveland • Distributors Everywhere

YOU MUSTN'T MISS—

Begins on page 264

which will guide components into precise position, ready to plug into the base plate. No wiring is needed. It's already been printed (or plated) on the base plate (FACTORY, September 1952, p. 274; October 1952, p. 84). A hot-solder dip makes the connection between base plate and leads.

The tough job · Dropping the components with a precision of 0.005 of an inch is the major task of the component assembly machine. Punched data cards will provide all the instructions. So every time there's a change in assembly, you just substitute the card necessary to make the design correction. The machine's nervous system takes over from there.

Advantages · Here are the important ones:

- **Higher production.** G-E says it wants to produce at least 2900 10-component assemblies a day. A single machine could turn out 50-component assemblies at a rate of 750 a day, the company adds.
- **Improved quality.** As long as the machines are in perfect working order, assemblies should be perfect. So inspection time ought to be reduced, too.

How soon it's due · G-E expects to deliver the first experimental models late this year. The component assembly machine is the biggest problem. The other two machines are already on the drawing board, says G-E.

When to Leave Fluorescents Lit

Turning off fluorescent lamps when a room is unoccupied for less than 10 or 15 minutes costs more in lamp wear than it saves in electricity. That was General Electric Co.'s conclusion after its study of the economies involved in switching off lamps as opposed to letting them burn.

Turn the page

DE LAVAL
CP PROCESS PUMPS

Two process pumps in one!

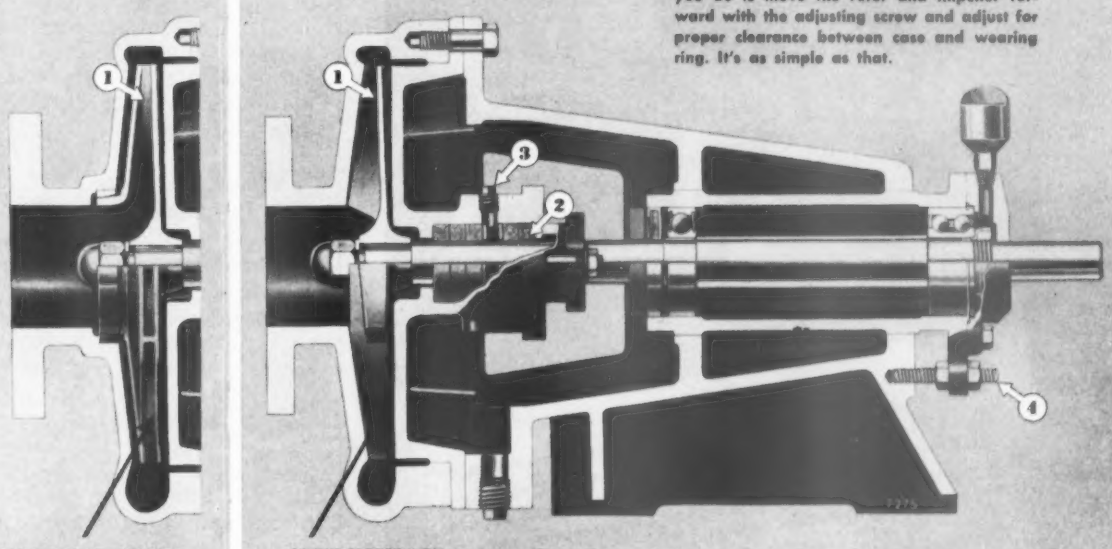
Look at these design extras

1. Choice of open or closed impellers.
2. Choice of flexible packing or mechanical seals.
3. Inlet-outlet water seal connections provide sealing liquid and cooling for mechanical seals.
4. Entire rotor can be adjusted axially by external adjusting screw.

When wear occurs on impeller face or case of open impeller pumps, simply face off worn parts, re-assemble and adjust to proper clearance with the adjusting screw. No shims needed—no fussy fits.

On closed impeller pumps the tapered wearing ring does the job. When wear occurs all you do is move the rotor and impeller forward with the adjusting screw and adjust for proper clearance between case and wearing ring. It's as simple as that.

SIZES TO 6"
CAPACITIES TO 1800 GPM
HEADS TO 200'



CLOSED IMPELLER **OPEN IMPELLER**

Let this two-in-one construction trim your pumping costs. If service requirements change, De Laval CP pumps can be quickly converted from closed to open impeller (or vice versa) by simply changing the pump volute and impeller. *There's no need to buy a whole new pump.*

CP pumps can be quickly changed from flexible packing to mechanical seals too. Gland faces are pre-machined and drilled to make it an easy job.

Whatever your processing application . . . whether you want to pump hot or cold clear liquids, viscous liquids, corrosive liquids or those carrying suspended solids . . . these versatile two-in-one CP pumps can meet changing requirements in your plant. Bulletin 1125 tells fully why they are . . . DESIGNED TO STAY ON THE LINE.

DE LAVAL *Process Pumps*

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DL-187

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Buschman Universal Cable Conveyor provides efficient overhead handling of parts through manufacture, assembly and shipping . . . speeds production, eliminates rehandling, doubles working capacity of plant floor area, lowers costs . . . . quickly pays for itself. Economical low weight of moving cable and trolley makes Universal CABLE the preferred conveyor in thousands of plants.
* 7 x 19 aircraft cable with Buschman patented non-slip trolleys and 3" Jr. T Track.
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Begins on page 264

Jellied "Ice" Lasts Longer

Here's a new refrigerant that promises to cause interest in metalworking plants that freeze parts to fit and in plants that ship perishables. It's a jellied "ice" that lasts from 3 to 5 times as long as ordinary ice and can be frozen at a wide range of temperatures.

All you have to do is mix a white powder with water, then freeze. There's no water run-off when the refrigerating effect has worn off, either.

The manufacturer: Chemical & Fiber Associates, Inc., Oakland, Calif.

Want to Pour a Furnace Lining?

Have you considered using castable refractories in your furnace operations? There's been a significant post-war trend toward use of the material you pour like concrete, though it acts like furnace-lining brick.

In the steel industry improved castables suitable for temperatures up to 3000F. have saved time in eliminating expensive cutting and fitting of brickwork, cut installation and maintenance costs, and reduced the skill necessary to line a furnace.

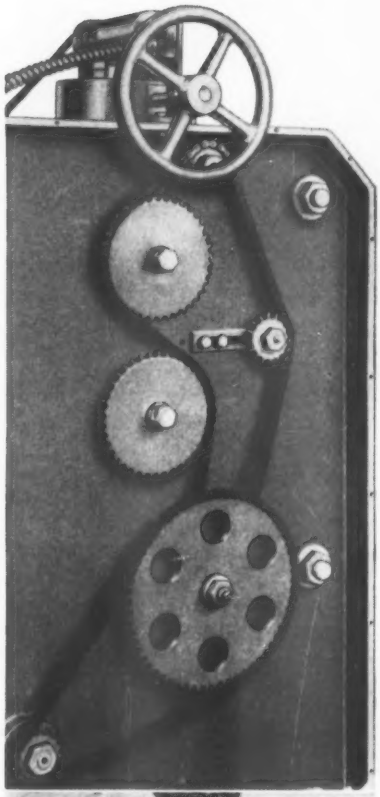
Where they're used • Soaking pit covers, high thermal head furnaces, cartops, burner blocks, billet and slab-heating furnaces; and for door linings on all types of furnaces, flat precast lintels, over slot type openings, for nose arches—wherever lots of cutting and fitting of regular fire brick would be required.

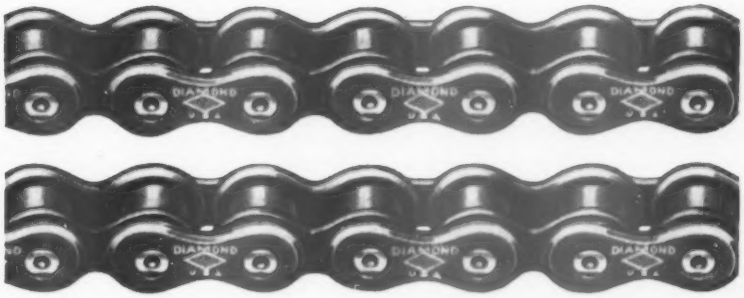
The information was given in a talk by J. D. McCullough, chief engineer, Refractories Div., Babcock & Wilcox Co., before a recent meeting of the Iron & Steel Engineers.

Turn the page

Only Roller Chains

Can Offer Such Wide Adaptability





- √ *Both Sides of Chain are Alike*
- √ *Operate Any Number of Shafts*
- √ *Simplify Selection of Shaft Locations*
- √ *Smooth, Slipless Operation*
- √ *Maintained Speed Ratios*
- √ *Wide Adaptability*

PITCH HOLE PREPARATION

Maximum rigidity of links insured by special pitch hole preparation for 100% effective bearing area of pin and bushing. Longer life, smoother operation.

SHOT-PEENING SINCE 1944

Diamond Chain has long recognized that certain types of internal stressing of chain parts would increase fatigue resistance. To this end, link plates have been specially processed and chain rollers and other parts have been shot-peened since 1944.

• Diamond Roller Chains engage sprockets equally well on either side, providing the design engineer with great flexibility as to the number of shafts driven from one driver, the driven shaft locations and direction of rotation. Size of sprockets determine speeds as desired.

Our engineering staff is ready to make recommendations.

DIAMOND CHAIN COMPANY, Inc.

Where High Quality is Tradition

Dept. 449, 402 Kentucky Avenue, Indianapolis 7, Ind.

Offices and Distributors in All Principal Cities

Refer to the classified section of your local telephone directory under the heading CHAINS or CHAINS-ROLLER

DIAMOND ROLLER CHAINS

Mr. Higby knows now . . .

YOU'RE SAFE WHEN YOU HAVE LEGGE TO STAND ON

LEGGE SYSTEM of Safety Floor Maintenance

It took a bad prattfall to get Mr. Higby to investigate the LEGGE System of Safety Floor Maintenance.

This is what he discovered:

1. Polished floors don't *have* to be slippery.
2. LEGGE Safety floor polishes and cleaners keep floors handsomely groomed *longer*.
3. They reduce slip-accidents by as much as *98%*. And buffing actually *increases* the slip-resistance of LEGGE materials.
4. LEGGE Maintenance saves up to *50%* on labor, *25%* on materials.

Our trained Safety Engineers work right with your cleaning crews, show them what products to use and how to apply them most effectively.

We'd like discussing *your* floor problems with you while you're in an upright position. Don't wait to "do a Mr. Higby" before calling us.

WALTER G. LEGGE COMPANY, INC., 101 Park Ave., New York 17, N. Y. Branch offices in principal cities. In Toronto —J. W. Turner Co.

Walter G. Legge Company, Inc.
101 Park Ave., New York 17, N. Y. A-1

Gentlemen:

☐ I'd like to know what Legge Safety Products can do for my floors. I have approximately _____ sq. ft. of _____ (composition).

☐ Send me your FREE booklet, "Mr. Higby Learned about Floor Safety."

Name_____

Firm_____

Street_____

City_____ Zone____ State_____

YOU MUSTN'T MISS—

Begins on page 264

How to Speed Roll Machining

A new hydraulic roll lathe, said to produce time savings of up to 75% in roll machining, is soon to be installed in U. S. Steel Corp.'s Fairless Works.

Big feature of the 60-in. unit is its ability to convert roll machining from an essentially manual, intermittent task to an operation approaching continuous flow. The lathe is equipped with a tool traverse carriage that introduces a continuous spiral cut. Manually operated roll lathes do not make this so-called "traverse cut." It not only eliminates considerable set-up time, but the pressure is constant. So variation and need for frequent adjustments are minimized.

Lighter work · Another important factor is that the hydraulic mechanism will relieve the lathe operator of lots of heavy manual work. Moving the tail stock on manual roll lathes, for instance, normally requires two men and a crowbar; and it may require crane service.

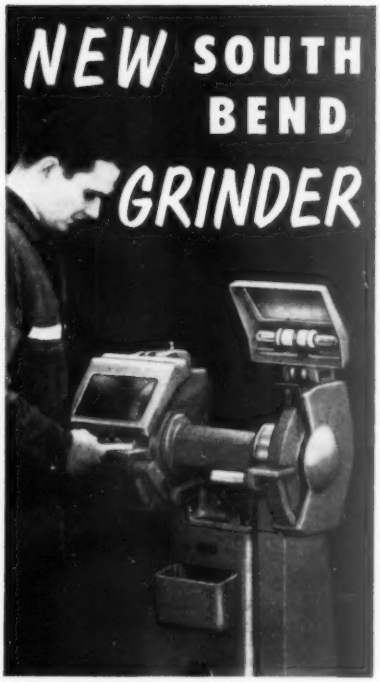
The machine was developed and built by Blaw-Knox Co.'s Lewis Foundry & Machine Div., Groveton, Pa.

Hospital, Industry Use Same X-Ray Unit

Build your new plant in Iceland and maybe you, too, can work this deal with your local hospital: Take your turn using an industrial radiographic X-ray machine. It's no joke.

Welds on the steel penstocks for an Iceland power plant now under construction are being inspected with the help of a 150-kv. radiographic X-ray unit. When it's no longer needed, the machine will be turned over to a nearby hospital for superficial therapy work.

Turn the page



A ruggedly built grinder that will give long, dependable service under hard use. Made in two sizes with 8" and 10" grinding wheels. Motor in pedestal and V-belt drive remove weight of grinding wheels from motor bearings, isolate motor from abrasive dust and provide more work clearance. Send for catalog.

Fast, accurate and easy to operate, this shaper can lower your machining costs on small parts. Handles a wide variety of work — releases larger shapers for heavier work — saves on investment, power and upkeep. Free catalog.

SOUTH BEND LATHE
SOUTH BEND 22, INDIANA
Building Better Tools Since 1906

South Bend MACHINE TOOLS

HERE'S AN EMPLOYEE RELATIONS PROGRAM

WHICH MAKES MONEY FOR YOU—AND YOUR EMPLOYEES

You can prove to employees that management has a sincere interest in their personal welfare—through a program that permits them greater earnings, better opportunities for advancement, greater working comfort and safety, less fatigue. And you can prove its value to your company—in specific dollars-and-cents terms.

"EYES RIGHT FOR THE JOB" MEANS BETTER WORKING EFFICIENCY

The program is the Bausch & Lomb Occupational Vision Service. It is a scientific method, based on findings of a continuing study at the Occupational Research Center of Purdue University, for correlating visual skills to job requirements. Now in its eleventh year, it is successfully operating in hundreds of plants, reducing costs and improving employee morale.

A PROVED METHOD TO HELP YOUR PLANT MAKE MONEY 9 WAYS

The Bausch & Lomb Occupational Vision Service is available to you. It is easy to administer. Employee participation is voluntary . . . *and workers like the program.* Benefits which accrue in plants using O.V.S. (benefits which can accrue in your plant, too) include:

1. Improved quality of production
2. Increased production per worker
3. Reduced waste of materials and work rejects
4. Improved accident record
5. Reduced labor turnover
6. Lowered training cost
7. More effective placement
8. Reduced absenteeism
9. Improved employee relations

1853 1953 INTO A NEW CENTURY OF OPTICAL PROGRESS
BAUSCH & LOMB CENTENNIAL

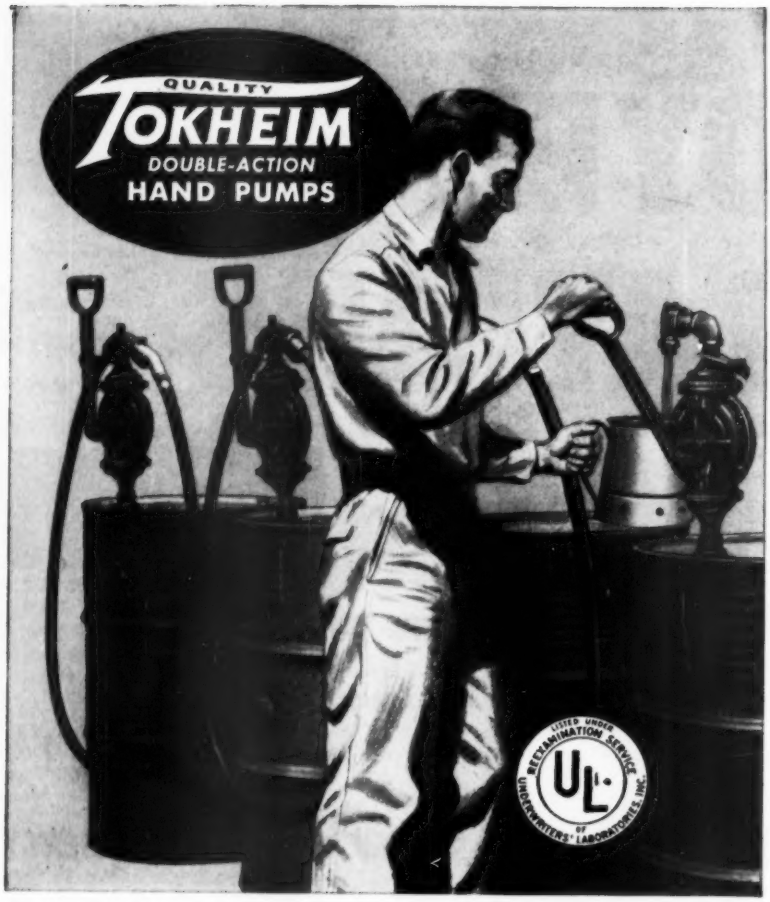
MAIL TODAY!

Send for the brochure "Eyes Right for the Job," which tells what the Bausch & Lomb Occupational Vision Service is, how easily it can be administered in your plant, and at what low cost.

Bausch & Lomb Optical Co., 95213 Smith St., Rochester 2, N. Y.

Please send me the brochure "Eyes Right for the Job," and complete details on the Bausch & Lomb Occupational Vision Service.

Name ..... Title .....
Company .....
Street .....
City ..... Zone ..... State .....



SAFER HANDLING

OF PETROLEUM AND SCORES OF OTHER LIQUIDS!

DO YOU NEED A PUMP FOR THESE LIQUIDS?

A Tokheim Will Handle Them All and Others. Tell Us Your Problem!

- ACETATES ☐
- ALCOHOLS ☐
- AROMATIC SOLVENTS ☐
- CHLORINATED SOLVENTS ☐
- GLYCOLS ☐
- KETONES and ETHERS ☐
- PETROLEUM SOLVENTS ☐
- PLASTICIZERS ☐
- PETROLEUM PRODUCTS ☐

For safer, better handling of liquids in plant or field, look to TOKHEIM PUMPS. This new double-action hand pump stops wasteful, dangerous dripping and slippery floors. Reduces fire hazard and accidents common to other methods of transfer. Saves on drum storage space. Speeds production, reduces operating costs. Handles scores of liquids efficiently. Choice of hose and spout models—for drums, skid tanks and underground installations.

Write for literature

General Products Division

TOKHEIM OIL TANK AND PUMP COMPANY

1652 Wabash Avenue, Fort Wayne 1, Indiana

Factory Branch: 1309 Howard Street, San Francisco 3, California

YOU MUSTN'T MISS—

Begins on page 264

TIMELY HINTS

Value Analysis: Key to Cost Cutting

A springy bronze clip held a cover in place on a control unit. Value analysis found a less springy clip made of tin-plated spring steel did just as good a job—at a saving of $3,500 a year.

That's only one example of the kind of money you can save with value analysis—a systematic method for squeezing every ounce of value out of materials that go into your product. It has already saved millions of dollars a year for General Electric Co. And it should save even more as a result of a new educational program designed to spread the idea through all G-E plants.

How it works · Value analysts are men with a variety of plant backgrounds who have been given special training. They study every conceivable operation that goes into making a product to find where less expensive materials or items can be substituted without lowering quality. When possible, they make suggestions for design changes. Operating departments then decide whether the changes are feasible. About 80% of the suggestions have been accepted, says G-E.

Value analyst's school · Classes run 8 hours a day. Students attend lectures and practice value analysis on G-E products. When the course is completed, they return home to set up value analysis units in their own plants.

Plant managers throughout the G-E system pick the men they want to send to school in Schenectady.

Turn the page

Successful movers like Suddath must be able to pack quickly and guarantee clean and safe shipments. Suddath prefers the superstandard action of Blue Ribbon tape.

"Damage claims reduced— thanks to Blue Ribbon gummed tape"

reports Suddath Moving & Storage Co., Inc.

Here is what this well-known moving and storage company reports about Blue Ribbon Superstandard Gummed Tape: "We require a tape with strength, which grabs with lightning-like speed and holds on with bulldog tenacity for an indefinite period of time under varied weather conditions. Only Blue Ribbon provides all these 'MUSTS' Thanks to Blue Ribbon, our damage claims have been reduced to a very low minimum."

But try Blue Ribbon yourself. Test it in your shipping room for one month. Discover how it can improve your shipping procedures.

MAIL THE COUPON for fact-packed booklet

Blue Ribbon

SUPERSTANDARD GUMMED TAPE

Available plain or printed, in choice of widths weights, lengths and colors

HUDSON PULP & PAPER CORP.

Dept. 45 505 Park Ave., New York 22, N. Y.

"HOW TO CUT COSTS IN YOUR SHIPPING ROOM"

Hudson Pulp & Paper Corp., Dept. 45
505 Park Avenue, New York 22, N.Y.

Please send me your helpful booklet, "How to cut costs in your shipping room."

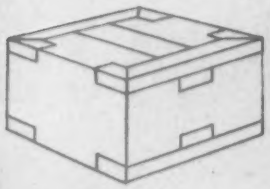
NAME _____

COMPANY _____

STREET ADDRESS _____

CITY _____ ZONE _____ STATE _____

Did you know?



Only Gummed Tape keeps your goods so fresh and clean

Your cartons are tightly *sealed* when you use Gummed Tape as the closure. The smoke and soot of shipping terminals cannot penetrate your carton's seams. Dirt, dust, moisture, and vermin . . . all are locked out with Gummed Tape.

Your merchandise arrives at its destination as neat and spotless as when you packed it. No other closure does so much to keep your goods so fresh and clean!

Remember too, only Gummed Tape reinforces your cartons—welding extra thicknesses of Kraft over seams and corners. Only Gummed Tape closures are so flexible and absorbent of shock—never interfere with the strong natural resiliency of your corrugated cartons. Only Gummed Tape *sells* as it safeguards your product, by displaying your imprinted messages. And only Gummed Tape closures are so practical and safe for your customers to open.

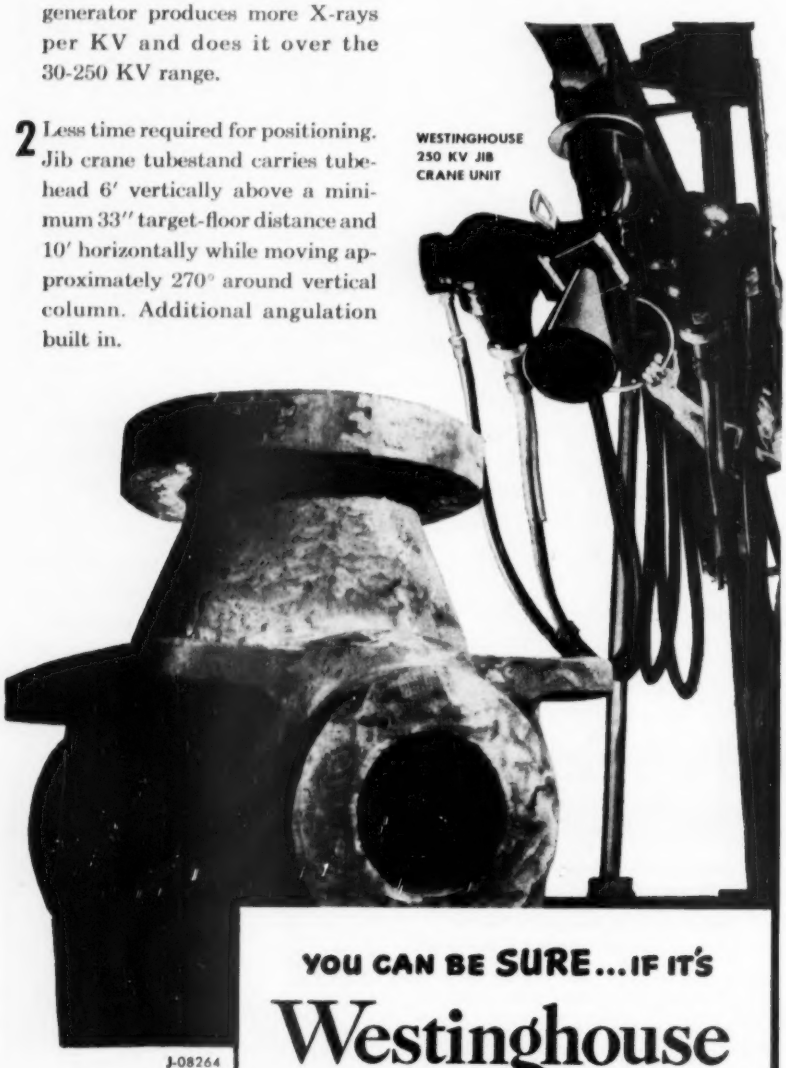
TOUGH JOBS *made easy*

At American Steel Foundries' plant in Newark, New Jersey, inspection of heavy steel castings is made easy by Westinghouse Industrial X-ray equipment. Reason: extreme *flexibility*.

1 Thick *or* thin materials take less time to radiograph. Westinghouse *Constant Potential* high voltage generator produces more X-rays per KV and does it over the 30-250 KV range.

2 Less time required for positioning. Jib crane tubestand carries tubehead 6′ vertically above a minimum 33″ target-floor distance and 10′ horizontally while moving approximately 270° around vertical column. Additional angulation built in.

Westinghouse assures you the finest, most flexible X-ray tools for your inspection jobs *plus* a coast-to-coast staff of technical experts. Call your Westinghouse X-ray representative or write Westinghouse Electric Corporation, 2519 Wilkens Avenue, Baltimore 3, Maryland.



WESTINGHOUSE 250 KV JIB CRANE UNIT

J-08264

YOU CAN BE SURE...IF IT'S **Westinghouse**

YOU MUSTN'T MISS—

Begins on page 264

Material Mishandling: Big Accident Cause

If you could eliminate all manual handling in your plant, you'd be able to cut your accident rate by about a third.

That's not an idle argument for automation. It's an obvious conclusion from a recent survey made by Lumbermens Mutual Casualty Co. of 20,000 industrial accidents in more than 20 diversified industries. Results showed that 31% of all accidents serious enough to need medical attention were caused by materials mishandling.

On severity basis. When you figure the damages on the basis of severity, you find that improper handling causes 6% of all fatalities, 21% of the permanent partial disabilities, and 25% of the temporary total disabilities.

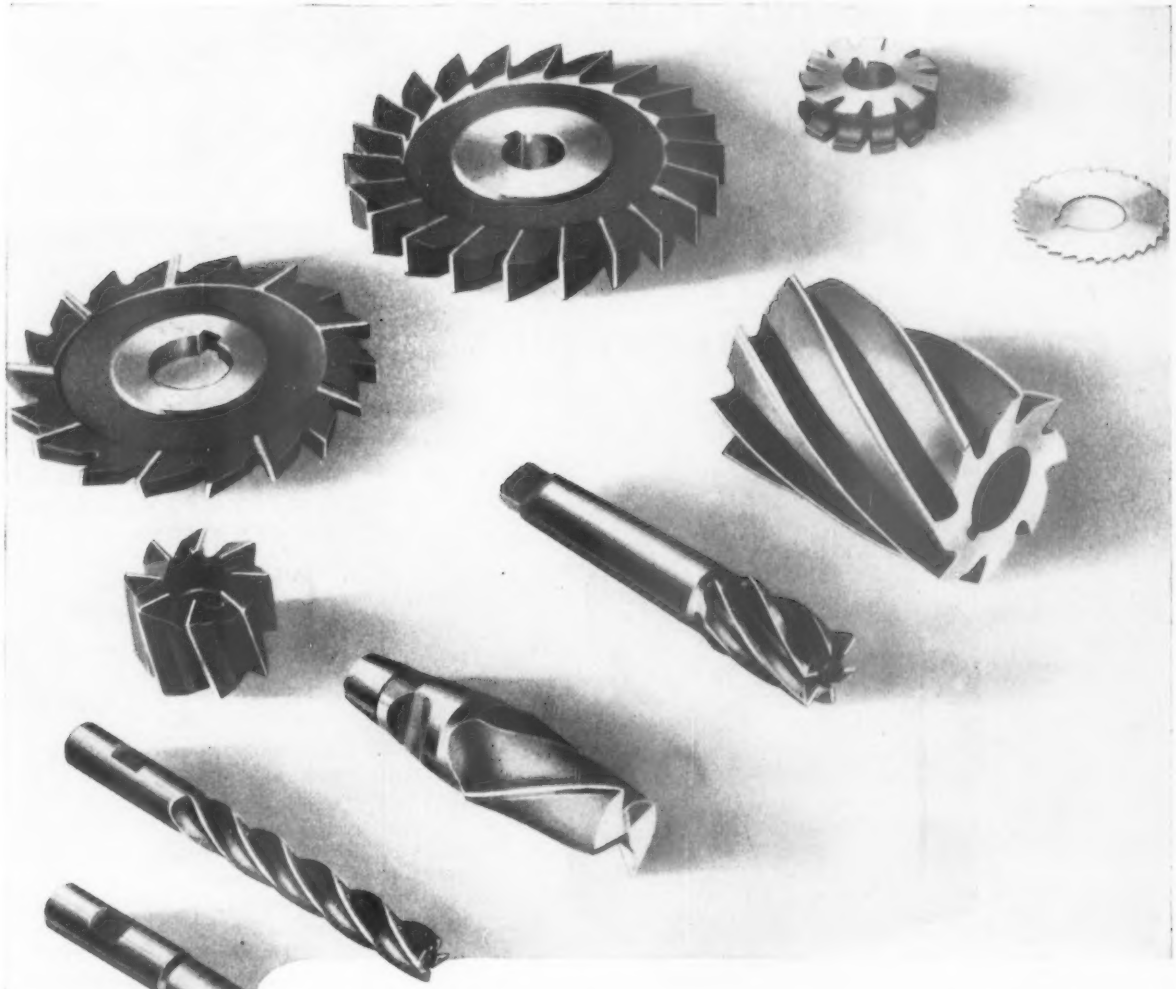
What causes the accidents? Here's a breakdown of the materials handling injuries.

- Allowing hands to be pinched by moving materials, 13.4%.
- Objects falling because of poor grip, 12.8%.
- Safety shoes not worn, 12.8%.
- Awkward lifting, 12.1%.
- Failure to use mechanical equipment provided, 11.5%.
- Lifting with the back instead of the legs, 11.0%.
- Handling materials in unsafe and crowded areas, 9.1%.
- Failure to wear hand protection, 6.8%.
- All others, 10.5%.

What to do about it • Maintain a continuous and active safety program. It's management's job. Workers often fail to recognize hazards that are apparent to their foremen, the survey concludes.

Editor's Note: You might also minimize manual handling and improve mechanized handling to reduce accidents *and* cut handling costs.

Turn the page



You Can Select Faster, More Efficient PRODUCTION

from the broader range of Brown & Sharpe Cutters

The closer you match your cutters to each job, the faster, more efficiently they will cut . . . and the less power it will take.

Brown & Sharpe offers a complete range of cutters that permits accurate selection of exactly the right cutter for each cutting job! Styles include every type from plain milling cutters and end mills to metal slitting saws and cutters for special uses. And every cutter is a *quality* product . . . designed and produced to fulfill the enduring accuracy that is built into today's milling machines.

Whenever you order cutters, specify Brown & Sharpe and be sure of getting maximum cutter productivity. Write for complete catalog. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

WE URGE BUYING THROUGH THE DISTRIBUTOR

Brown & Sharpe B·S

HEIN-WERNER HYDRAULIC JACKS

Simplify

countless industrial jobs

It's really "mind over matter" when you use hydraulic force to handle the tough jobs around the plant. For instance, this Model 30.11AA Hein-Werner Hydraulic Jack provides 60,000 lbs. of hydraulic pressure for any pushing, pulling, bending, or straightening operation. With it, one man can easily lift big loads, move heavy machinery, bend rods, press bushings, and handle hundreds of similar heavy-duty jobs. There's no need for crews or helpers . . . no confusion or wasted man hours. The Model 30.11AA weighs only 71 lbs. and has a convenient carrying handle. Its tandem pump speeds jacking and saves effort. Individual testing at 1½ times rated capacity assures safety. See your industrial supply distributor or write us.

Hein-Werner Hydraulic Jacks are available in models of 1½, 3, 5, 8, 12, 20, 30, 50, and 100-tons capacity. H-W Jacks of 12-tons capacity and larger have carrying and positioning handles. "PUSH and PULL" Hydraulic Jacks come in models of 4, 10, and 20-tons capacity.

HEIN-WERNER CORPORATION

Waukesha, Wisconsin

Hein-Werner HYDRAULIC JACKS

YOU MUSTN'T MISS—

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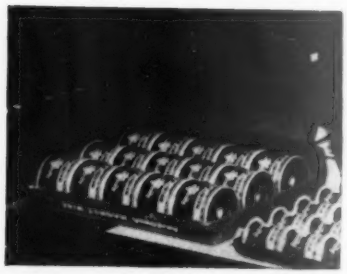


PRIZE PACKAGE is this replacement for wooden box. It points up . . .

Why It Pays to Package Better

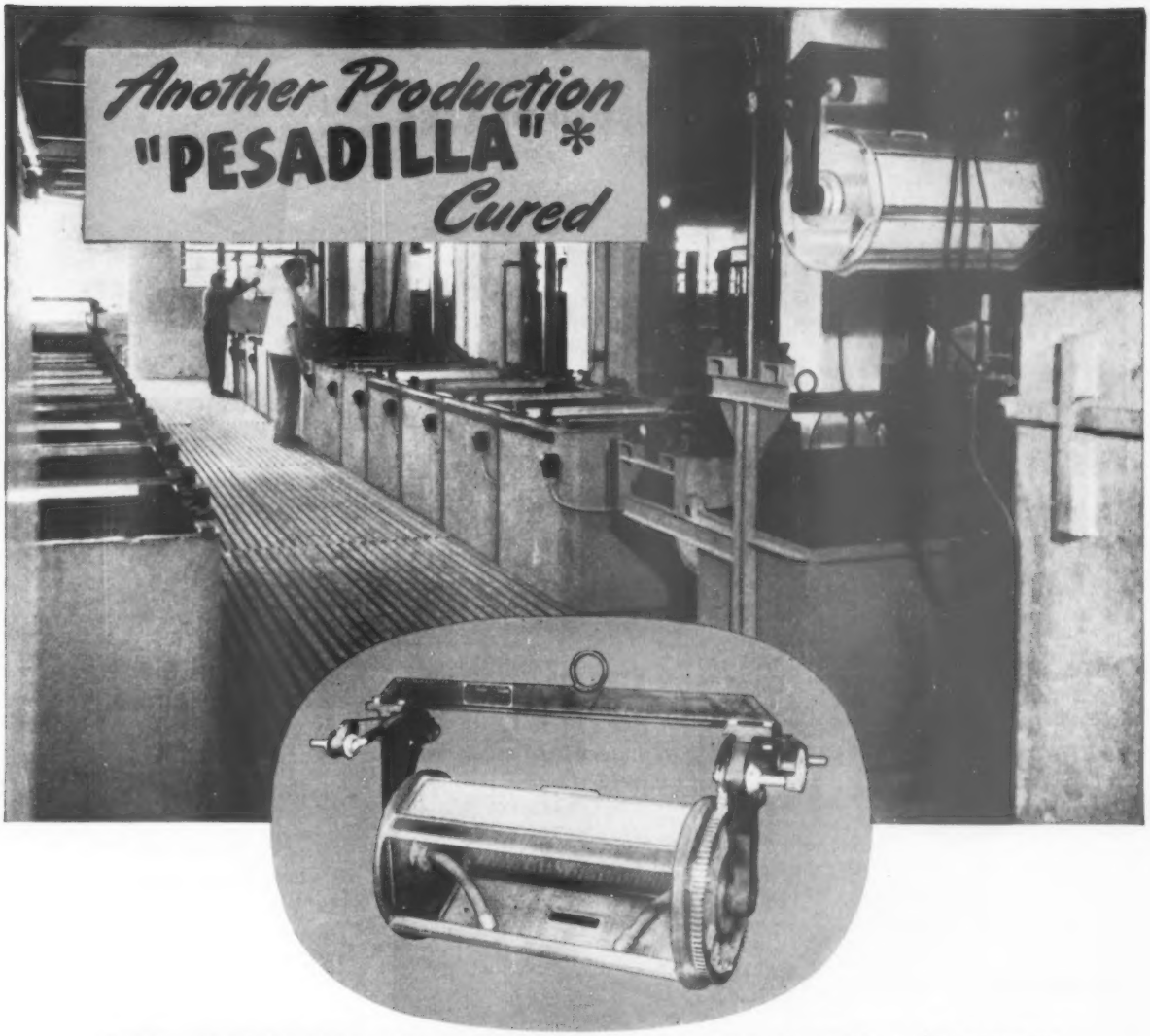
It may take a lot of time and effort, but it really pays to find a better way to package your product.

After long months of research and experiment, Anaconda Wire & Cable Co. came up with a molded fiber container for magnet wire designed to replace wooden boxes. Its advantages:

1. Damage to wire is virtually eliminated.
2. Molder fiber case weighs a third as much as wooden case.
3. It requires no interior or extra packing.
4. Magnet wire spools are easier to pack and unpack.
5. When opened, the molded cases may be used as trays for handling spools.
6. When empty, case halves nest in one-third the storage space required for wooden cases.
7. Cases are returnable and re-usable and can be palletized.
8. Lighter tare weight reduces freight cost.
9. It's possible to bulk-weigh magnet wire for the first time, since tare weight is controlled.

There's another benefit, too, if you do *that* kind of job on your product. You've got a good chance to win first prize at the Annual Industrial Packaging and Materials Handling Exposition. Anaconda did.

Turn the page



WITH **UDYLITE** HI-PRODUCTION LUCITE PLATING BARRELS!

Here's what Mr. J. Sulser, owner and operator of one of Rio de Janeiro's most up-to-date plants†, thinks of Udylite equipment.

"Our plant practically runs itself. No more production headaches. No more dangerous bottlenecks or equipment breakdowns, thanks to our twenty-one Udylite Plating Barrels."

After creating his new South American barrelplating plant built around Udylite equipment, Mr. Sulser is getting high production, low dragout losses and *NO* overtime! And what's more, he's getting all these benefits with work normally considered too small for barrelplating.

If you're having production troubles, why not let The Udylite Corporation help you, too? A complete research staff . . . plus production know-how . . . are at your service. See your Udylite technical representative or write direct. *The Udylite Corporation, Detroit 11, Michigan.*

***HEADACHE**

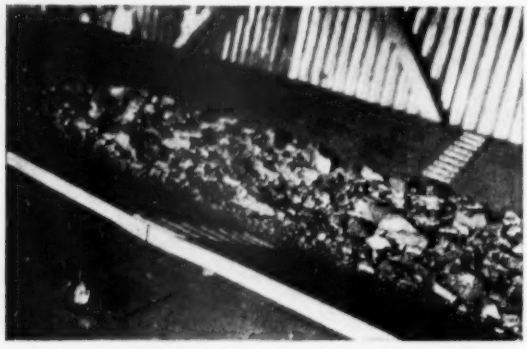
†Companhia Fábrica De Botões E Artefactos De Metal

PIONEER OF A BETTER WAY IN PLATING

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

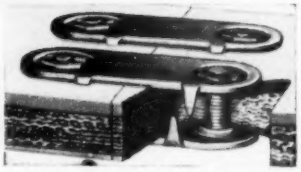
FLEXCO®

BELT FASTENERS and RIP PLATES



FOR HEAVY CONVEYOR AND ELEVATOR BELTS OF ANY WIDTH

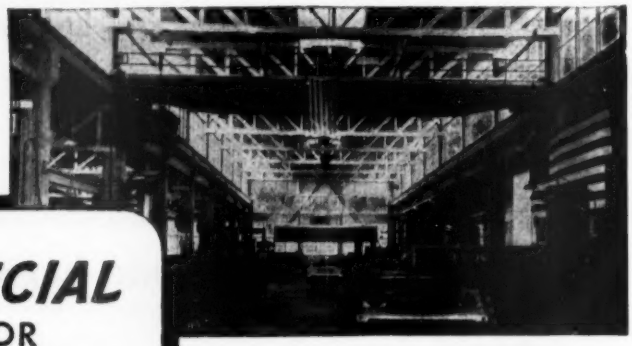
★ FLEXCO Fasteners make tight butt joints of great strength and durability.
★ Trough naturally, operate smoothly through take-up pulleys.
★ Distribute pull or tension uniformly.
★ Made of Steel, Monel, Stainless, Everdur. Also Promal top plates.
★ FLEXCO Rip Plates are for bridging soft spots and FLEXCO Fasteners for patching or joining clean straight rips.



Compression Grip distributes strain over whole plate area

Order From Your Supply House. Ask for Bulletin F-100

FLEXIBLE STEEL LACING CO., 4678 Lexington St., Chicago 44, Ill.



SPECIAL OR GENERAL PURPOSE USE

● Standard Euclid Cranes are available in capacities of 3, 5, 7-1/2, 10, 15, 20 and 25 tons in various spans. Over 90% of your material handling requirements can be met with standard Euclids, whether they are put to Special or General Purpose use.

Euclid Crane construction embodies high grade, wide face, coarse pitch gearing throughout with extra strength shafts and anti-friction bearings to assure longer life and lower power consumption.

THE EUCLID CRANE & HOIST COMPANY
1364 CHARDON ROAD • EUCLID, OHIO

EUCLID CRANES

WRITE FOR CRANE CATALOG

YOU MUSTN'T MISS—

Begins on page 264

QUOTES

"We could increase productivity 20 to 30%

". . . if we could get that much improvement in our subordinates' attitudes toward their jobs and willingness to cooperate to achieve the company's goals."—*J. Frederick Schock, Chief Industrial Engineer, Leeds & Northrup Co.*

"A modern industrial plant . . .

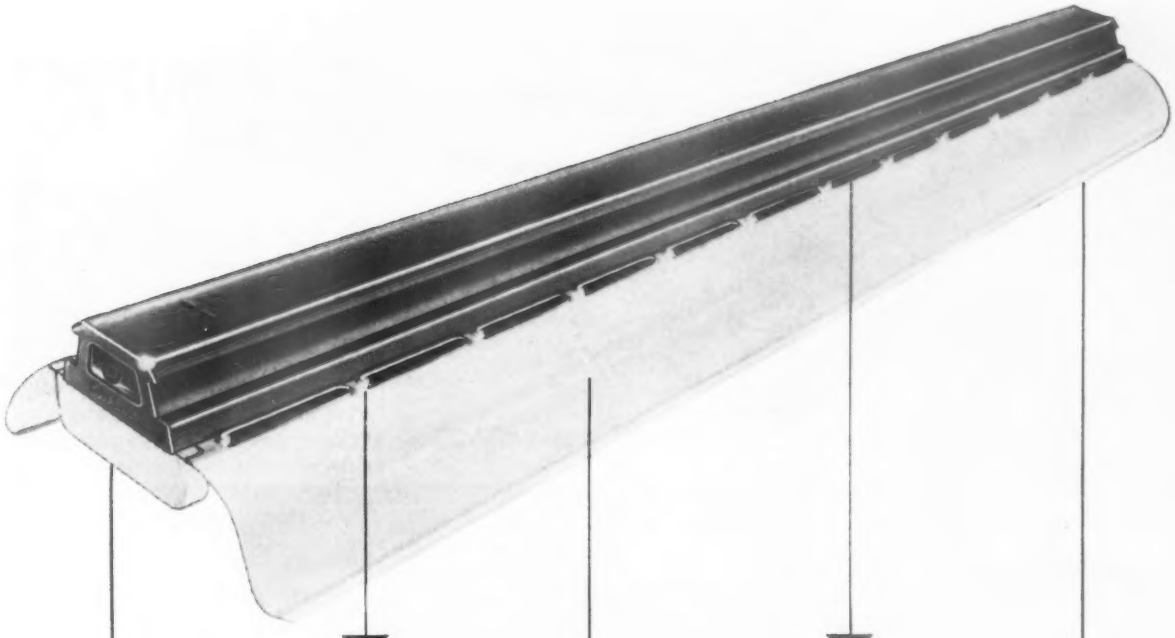
". . . is a school of experience and practice and a school for rigorous and involved learning."—*Eugene W. Ritter, Vice President, Westinghouse Electric Corp.*

"No live industry can keep pace . . .

". . . with the advance of technology without continuous renewal and transformation of its productive facilities. Existing equipment must be kept on the defensive, compelled always to justify its tenure against the challenge of new and more modern machines. If any piece of existing equipment fails to meet this challenge, it must be displaced, regardless of its age or condition and regardless of whether it is physically 'worn out.' A re-equipment policy that fails to give full recognition to obsolescence is bound to lead to bad mechanization and inefficiency.

"If new equipment and machines were available free, every company would naturally keep its productive facilities completely modern. However, new equipment costs too much to discard existing facilities every time there is an advance in the arts.

Turn the page



1 COMFORT FOR INDUSTRY. Die-embossed apertures in reflectors provide 10% uplighting for improved visual comfort and freedom from irritation and nervous fatigue due to eyestrain.

2 COOLER, CLEANER OPERATION. A gentle flow of air passes through apertures reducing dirt and dust deposits. This "breathing" action keeps fixture cooler, cleaner and more efficient.

3 TURRET® SOCKETS. Sturdy, vibration-proof Turret sockets are standard equipment on all CFI Day-Lines — providing positive lamp seating and simple lamp installation or removal.

*® G. E. Co.

4 ALL-WHITE PORCELAIN REFLECTORS. Outside as well as inside, every inch of reflector surface is finished in snow-white porcelain enamel—providing maximum high reflection surface for greater efficiency.

5 WIPED REFLECTOR EDGES. Excess porcelain enamel is carefully wiped away from reflector edges—an extra operation that eliminates chipping and crazing of the finish at a most vulnerable spot.

6 bonus advantages you get with CFI Day-Line® Industrial fixtures

6 NEW LOW COST. *CFI Day-Line prices are substantially lower because of improved construction methods.* Get the full CFI Day-Line story. Write today for Bulletin OD-568—the story of COMFORT FOR INDUSTRY at new low prices!

DECIDEDLY BETTER
DAY-BRITE
Lighting Fixtures

Day-Brite Lighting, Inc., 5441 Bulwer Ave., St. Louis 7, Mo. In Canada: Amalgamated Electric Corp., Ltd., Toronto 6, Ontario.

288

Yes, you can make one false note and be all washed up . . . with the name you've spent years building, quickly consigned to oblivion. We at Kester know the importance of consistency . . . make sure that the solder alloy and especially the flux formula never varies, never changes. Kester never experiments at the expense of the solder user!

Remember that Kester, *the engineered Solder*, can give you the Solder you require . . . 8 Fluxes in Core Solder with 5 different core-openings to select from, which provides the exact flux content needed. Also Solid Wire and Bar Solder and "Solderforms" (preformed Solder).

KESTER

SOLDER COMPANY

4213 WRIGHTWOOD AVENUE, CHICAGO 39, ILLINOIS
NEWARK 5, NEW JERSEY; BRANTFORD, CANADA

YOU MUSTN'T MISS—

Begins on page 264

Therefore, the installed capacity of industry necessarily lags.

"The problem is not to eliminate the lag but to hold it to the lower limits that are economically justifiable. Thus it follows that the primary task of re-equipment policy is a continuous and timely transformation of installed facilities."—*Robert S. Collier, Plant Manager, Cincinnati Milling Machine Co.*

Factory Management and Maintenance is a consolidation of *Factory and Industrial Management* and *Maintenance Engineering.*

Factory and Industrial Management grew from consolidations, mergers, or absorptions involving the following publications: *The Engineering Magazine; Industrial Management; Factory, the Magazine of Management; Management Engineering; Administration; Management and Administration; Management and Administration in Manufacturing Industries; Manufacturing Industries.*

Maintenance Engineering grew from consolidations, mergers, or absorptions involving the following publications: *Review of the Telephone and Telegraph; Electrical Review; Western Electrician; Electrocraft; Electrical Engineering; Electrical Review and Industrial Engineer; Industrial Engineer; Industrial Engineering; Industry Illustrated.*

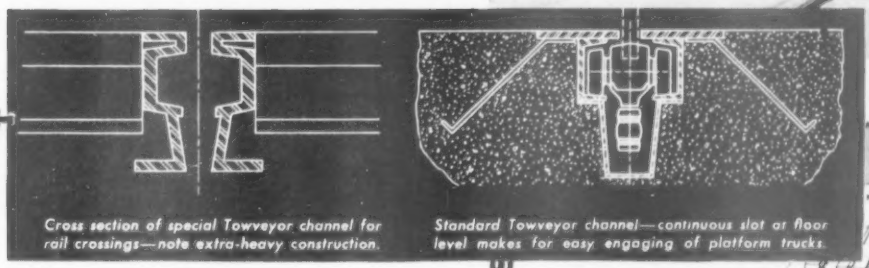
In addition, features of the publication *Timely Ideas* have been added.

All rights in the above names are reserved by the publisher.

WEBB

TOWVEYOR

provides conveyor handling of freight on Santa Fe station platforms



Cross section of special Towveyor channel for rail crossings—note extra-heavy construction.

Standard Towveyor channel—continuous slot at floor level makes for easy engaging of platform trucks.

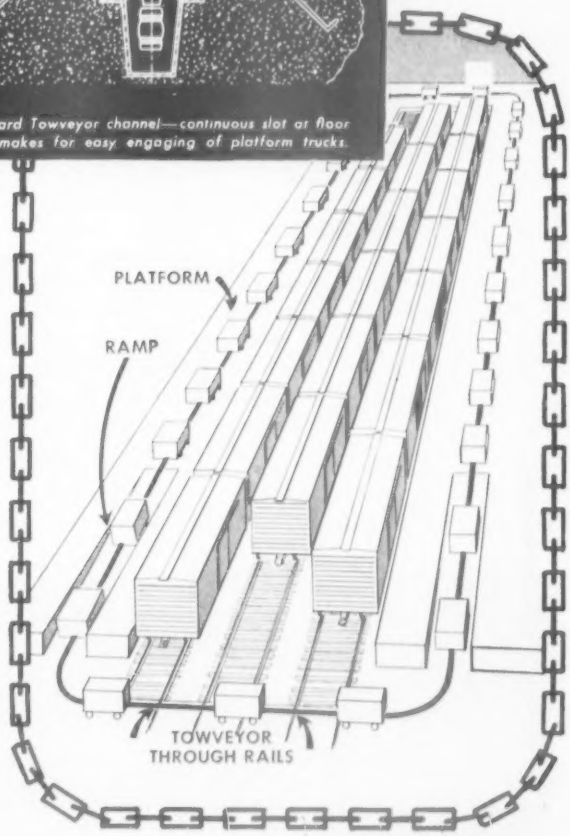
"Keep It Moving"

That is the command in every freight station. Here is how especially designed and installed Towveyor systems at the new Santa Fe Freight Station in Chicago help handle freight faster and easier with minimum cost.

Two Towveyor systems were installed—system "A" (2700 ft. long) serves three outbound tracks and system "B" (2400 ft. long) an inbound track. Combined capacity of these two Towveyor systems is 340 platform trucks, each capable of carrying 500 lbs. of freight. Rate of chain travel is adjustable for selected speeds from 110 ft. to 160 ft. per minute.

It was necessary for system "A" to cross the three outbound tracks in a manner that would not interfere with freight car switching. The efficient answer was removal of a small section from each track and channeling of Towveyor chain through these openings (Santa Fe and Webb engineers collaborated in the development of this unique installation feature). Stopping Towveyor travel permits unhampered and normal switching of cars.

In all other areas the Towveyor chain track is imbedded in the concrete platform floors. This leaves platforms clear of all obstructions for free, easy and faster freight handling operations. It is now possible to have at any given time, 170,000 lbs. of freight automatically moving along Santa Fe platforms—*Towveyors "Keep it Moving."*



JERVIS B. WEBB CO.

Conveyor Engineers and Manufacturers

8939 ALPINE AVE. • DETROIT 4, MICHIGAN

Send for fully illustrated catalog that provides complete information on Webb floor type conveyors.

OFFICES IN PRINCIPAL CITIES • FACTORIES IN DETROIT, LOS ANGELES, HAMILTON, ONTARIO

What lies behind America's

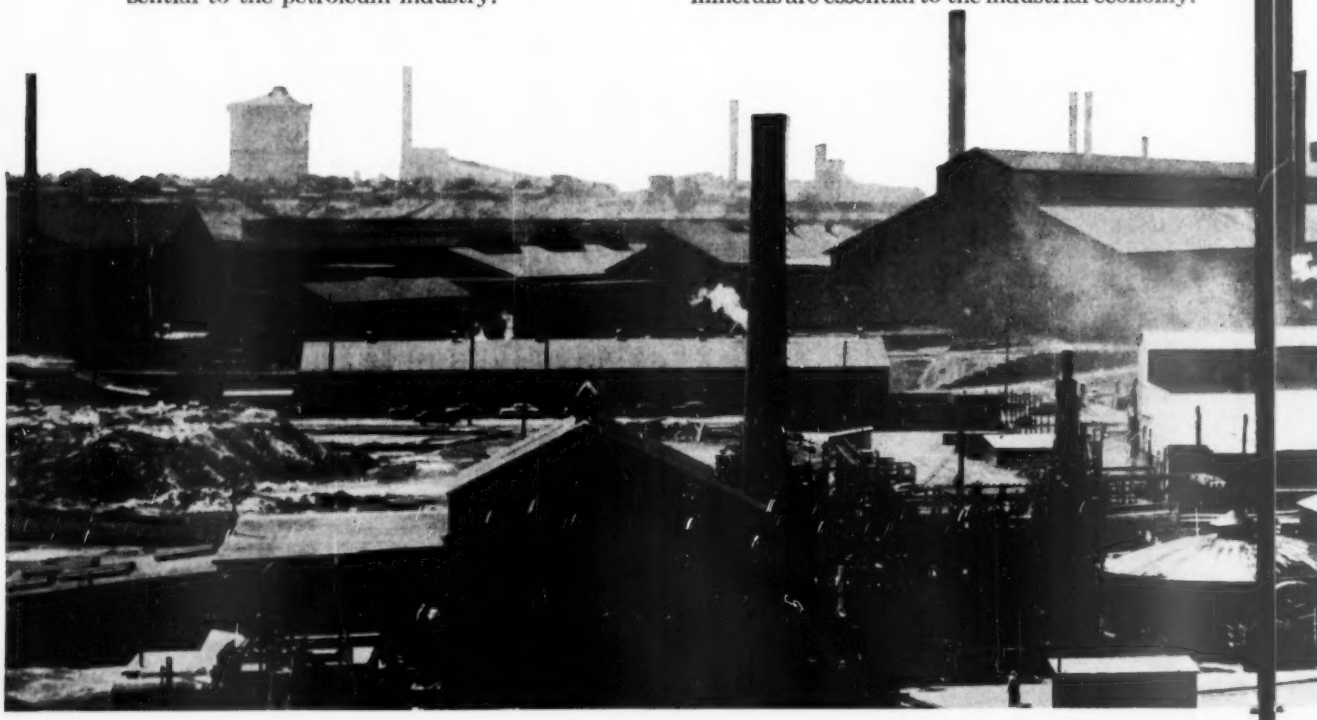
You hear a lot about America's famous production-line technique.
But little is said about what keeps those production lines moving.

TAKE IRON ORE. Without iron ore there could be no steel; without steel, no tanks, trucks, ships or guns—and no machines with which to make them. Hewitt-Robins mine conveyors, vibrating screens, self-unloader boats, storage and blending systems, belting and hose all help to supply the ore that makes the steel to keep production lines moving.

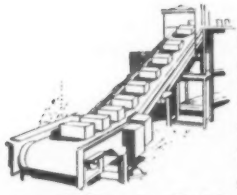
TAKE POWER. Without power all production must cease. Power is fuel converted into energy. A major source of that energy is coal. Wherever coal moves in bulk . . . at the mine or the power plant . . . it moves on belt conveyors. Power is essential in everything that is manufactured. Hewitt-Robins products are essential in the manufacturing of power.

TAKE OIL. Without lubricants, machines cannot operate efficiently; without fuel, they cannot operate at all. To make petroleum products available—to produce lubricants and fuel—four essential functions must be performed: drilling, refining, marketing and distributing. In each function, hose is an essential conveying medium. Hewitt-Robins hose is essential to the petroleum industry.

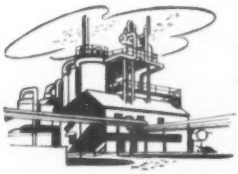
TAKE MINERALS. Without bauxite there would be no aluminum. Without copper there would be no brass and bronze. Without galena there would be no lead. Without sand and gravel there would be no concrete. Minerals must be mined, moved, sized and stored. Hewitt-Robins conveying and vibrating machinery is as essential to the mineral industry as minerals are essential to the industrial economy.



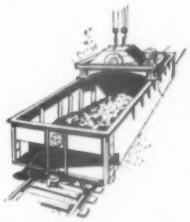
leadership in mass production?



TAKE FOOD. Without food, there cannot be life. In the granary and the dairy, in the cannery and the slaughterhouse, wherever food is grown or processed Hewitt-Robins hose and belting, conveyors and screens move foods faster and with a minimum of manual attendance.



TAKE CHEMICALS. Without chemicals there would be no medicine, no parachutes, no gunpowder. Whether solid or fluid, at the source or in semi-finished or finished form, chemicals move on, in, over and through products of Hewitt-Robins.



TAKE RAILROADS. Without enough railroad cars, adequate supplies of materials cannot keep production lines humming. The shortage of railroad cars is critical; those available must make more trips. Gondola cars carry coal, ores and other granular materials to factories. Once it took as many as 12 men as long as 18 man-hours to unload a single gondola car by hand. Now a car can be unloaded mechanically by only 2 men in about 90 seconds with a Hewitt-Robins car shakeout.

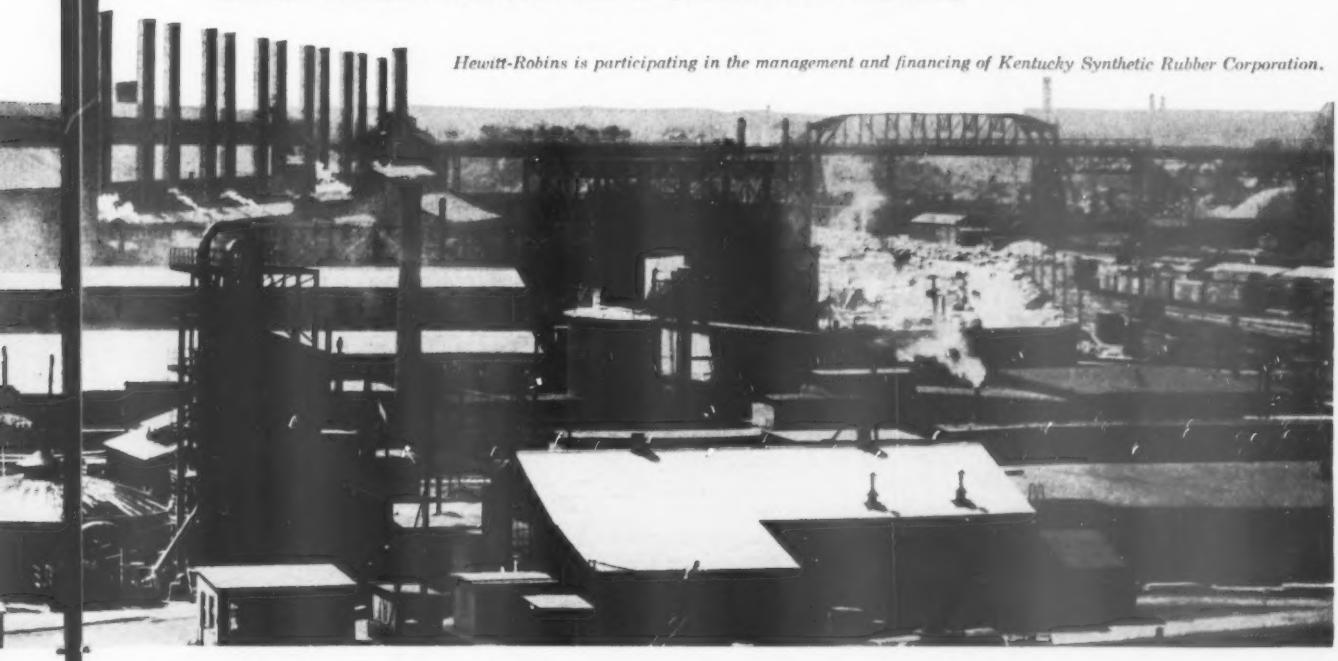
In all fields, Hewitt-Robins products are essential factors behind America's world leadership in mass production.

HEWITT HR ROBINS

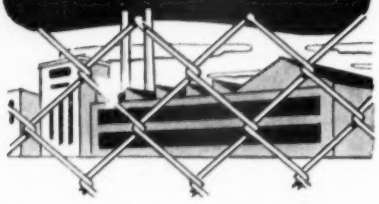
Executive Offices: Stamford, Connecticut

HEWITT RUBBER DIVISION: Belting, hose and other industrial rubber products
ROBINS CONVEYORS DIVISION: Conveying, screening, sizing, processing and dewatering machinery
ROBINS ENGINEERS DIVISION: Designing and constructing materials handling systems
HEWITT RESTFOAM DIVISION: Restfoam® pillows and comfort-cushioning

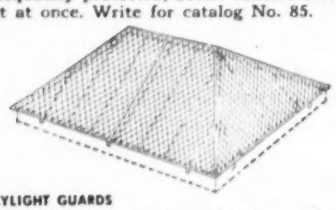
Hewitt-Robins is participating in the management and financing of Kentucky Synthetic Rubber Corporation.



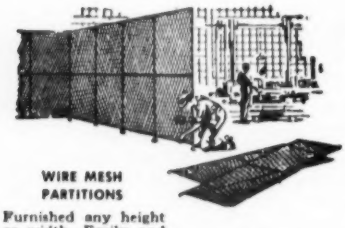
There's Security Behind a
STEWART FENCE



The more difficult you make it for trespassers, the less chance there is of having trouble. Unfenced property invites vandalism. But when you surround your plant with a Stewart Chain Link Wire Fence, place guards at all windows and skylights, install steel gates at shipping room doors, you're practically invulnerable against trouble originating from the outside. Check all points of entrance NOW. If they are not adequately protected, better contact Stewart at once. Write for catalog No. 85.

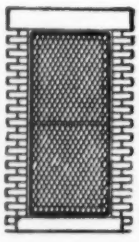


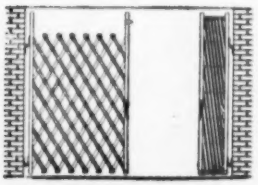
SKYLIGHT GUARDS
Strong, durable, prevent glass breakage and unwarranted intrusion. Prices on request.



WIRE MESH PARTITIONS
Furnished any height or width. Easily and quickly erected. When writing for prices, please give all measurements involved.

WINDOW GUARDS
(Wire or Iron)
Made with round or channel frames to fit any size or shape opening. When requesting prices, please give measurements and send diagrammatic sketch.





STEEL FOLDING GATES
Made in single or double gate construction to fit any width opening. Prices on request. Please give width and height of opening.

THE STEWART IRON WORKS CO., INC.
2056 Stewart Block Cincinnati 1, Ohio
Experts in Metal Fabrications Since 1886

Stewart IRON and WIRE FENCES

Test Your Reading Ability

Answer the question below *after* you have read "Ultra-Fast Communication" on page 94. Correct answers on page 286.

1. Under the new system, manufacturing cycle time will be cut by:
——a. One fifth ——b. One third ——c. One half
——d. One quarter

2. About how many days does it now take to put through priority orders?
——a. 5 ——b. 15 ——c. 25 ——d. 40

3. What was formerly a big time-consumer for skilled craftsmen?
——a. Unnecessary re-work on damaged pieces
——b. Delays in delivery of material
——c. Waiting to check out on jobs
——d. Waiting for tools

4. The plant manager believes one benefit, long-term, may be the single biggest advantage of the new system. This benefit is:
——a. Foremen have more time to spend on truly "managing" their departments
——b. Foremen and plant manager know exactly the status of every job at any time
——c. In-process inventories of sterling silver (at 80¢ an ounce) have been cut way down
——d. New lines of "high style" silverware can be put out faster

5. How many schedulers does the Towle system use?
——a. 3 ——b. 7 ——c. 12 ——d. 15

6. Which of the following best describes how the Temperator network operates?
——a. Just like dial telephone, but with different mouth piece
——b. Dial system and 12 "total" windows, coupled to tape printer
——c. Dial system and 12 "total" windows, but no tape printer
——d. Dial system interlocked with 2-way intercom

7. Which *one* of the following is a reason why the Executone intercom was added to the Temperator network?
——a. Lines were busy all the time, wasting employees' time
——b. Shop noises were so loud messages were being garbled
——c. Frequent errors were cropping up in transmission
——d. Schedulers were not getting complete picture of what was going on in shop

8. Under the Towle system, what happens to employee time cards?
——a. Employees no longer fill out time cards
——b. Time cards are entirely eliminated
——c. Timekeepers now fill out cards
——d. The foremen take care of the cards

9. How many "squawk box" systems are there?
——a. 3 ——b. 6 ——c. 12 ——d. 24

10. What advantage has come from having foremen drop in to look at the loading boards in the central production control office?
——a. Fewer grievances get beyond the first step in grievance procedure
——b. Departments aren't unbalanced because wrong orders are pushed
——c. Plant manager and foremen understand each other better
——d. Schedulers aren't kept busy answering foremen's questions all day

Turn the page

No. 1-B electric vibrating Feeder—for small-capacity operations up to 3500 pounds per hour. Ideal for laboratory use.

VIBRATING EQUIPMENT

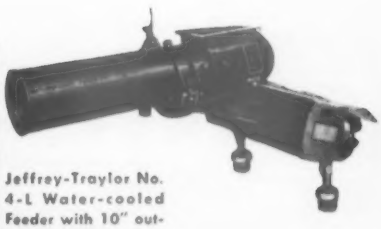
FEEDERS COOLERS
DRYERS CONVEYORS
PACKERS SCREENS

A type and size to meet requirements in continuous processing—at low over-all cost.

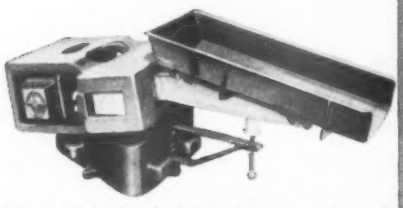
Absolute control over flow of wide variety of materials.

ULTIMATE IN FLEXIBILITY!

Literature Available



Jeffrey-Traylor No. 4-L Water-cooled Feeder with 10" outside diameter x 4' long water-jacketed deck. For feeding to high temperature furnaces or for handling extremely hot materials.

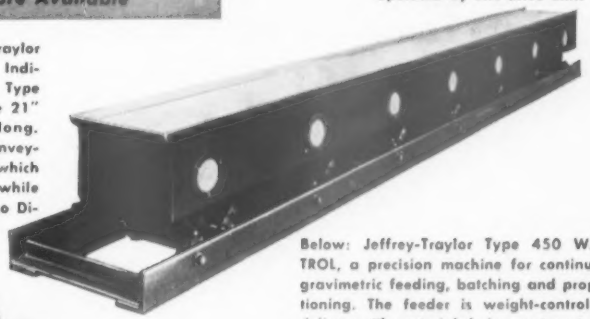


Jeffrey-Traylor No. 3 electric vibrating spark-proof Feeder with 12" x 30" open-pan deck. For feeding operations in hazardous atmospheres or under extreme moisture conditions.

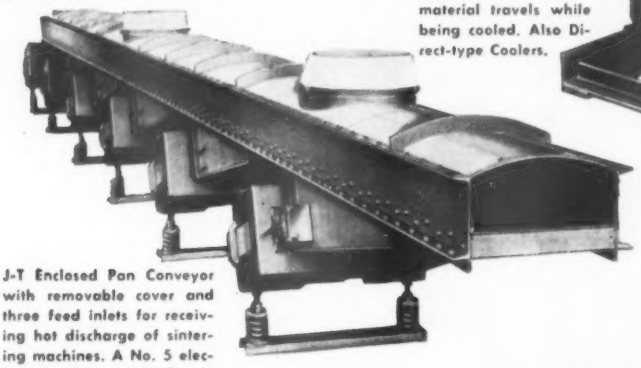
M-V Mechanical Vibrating Conveyor for conveying abrasive, lumpy or rough materials, hot or cold, dry or wet, as well as fine materials. Up to 80' can be operated by one drive unit.

Jeffrey-Traylor electric vibrating Spreader Feeder, 14" wide x 70" long with one edge tapered to spread to 55" width.

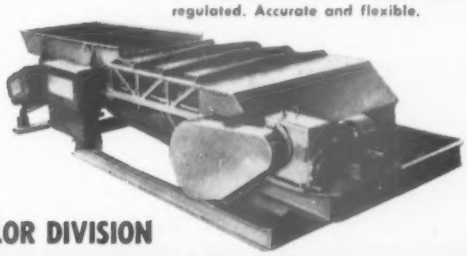
Right: Jeffrey-Traylor electric vibrating Indirect-type Cooler. Type HI-21F open type 21" wide and 18' long. Has solid plate conveying surface over which material travels while being cooled. Also Direct-type Coolers.



Below: Jeffrey-Traylor Type 450 WAY-TROL, a precision machine for continuous gravimetric feeding, batching and proportioning. The feeder is weight-controlled, delivery of material being automatcally regulated. Accurate and flexible.



J-T Enclosed Pan Conveyor with removable cover and three feed inlets for receiving hot discharge of sintering machines. A No. 5 electric vibrating type, 25" wide x 45' long.



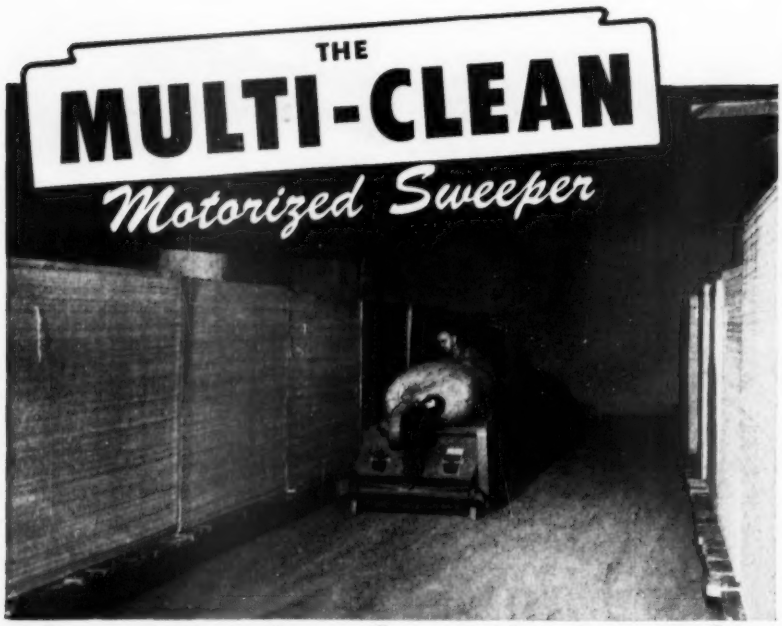
JEFFREY-TRAYLOR DIVISION

CAPACITIES—FROM A FEW OUNCES TO TWO THOUSAND TONS PER HOUR

THE JEFFREY MANUFACTURING COMPANY

511 North Fourth St., Columbus 16, Ohio

Material Handling Processing and Mining Equipment



Cleans 12 miles of warehouse aisles in 6 HOURS!

THIS IS THE AMAZING RECORD achieved by one man and the new, improved Multi-Clean Motorized Sweeper in a large paper products plant. It formerly took 3 men with push brooms 8 hours to sweep these 8-ft. concrete aisles. Now, one man is able to do the heaviest sweeping jobs better and in a fraction of the time required by the old-fashioned push broom method.

THE MULTI-CLEAN MOTORIZED SWEEPER cleans up dirt, dust, steel shavings, paper, grass, small metal parts and milling debris thoroughly and economically. It is ideal for cleaning floors in large factories, warehouses, commercial buildings, and for sweeping parking lots, freight docks, sidewalks, streets and alleys.

SWEEPING IS DONE BY 8 STURDY 36-inch hardwood, Palmyra filled brushes welded into a single circular unit. Effective sweeping width is increased to 48-inches by use of a side brush attachment. The built-in vacuum is mounted directly on the engine shaft. A Briggs & Stratton air-cooled engine delivers adequate power to operate the sweeper and pull the operator on the riding sulky.

GUARANTEE: THE MULTI-CLEAN MOTORIZED SWEEPER is guaranteed for a period of one year against defects in material and workmanship. Its trouble-free service, easy operation and low price make it the best buy in the motorized sweeper field.

1 MAN
WITH MOTORIZED SWEEPER
EQUALS 20 MEN WITH BROOMS

SEE THE SWEEPER
AT OUR BOOTH 1152
PLANT
MAINTENANCE
SHOW
CLEVELAND
JAN. 19-22, 1953

MULTI-CLEAN
PRODUCTS INC

MAIL THIS COUPON TODAY!

MULTI-CLEAN PRODUCTS, INC.
2277 Ford Parkway, Dept. FM-1, St. Paul 1, Minn.
Send me more information on the Multi-Clean Motorized Sweeper.

*Name*_____
*Address*_____
*City*_____ *Zone*____ *State*_____

Insist on Genuine Multi-Clean Attachments and Replacement Parts

TEST YOUR READING ABILITY

Begins on page 284

SCORING INSTRUCTIONS

Be sure to figure all three of your scores: comprehension, speed, and reading index. For a full explanation of these scores, as well as information on how to improve your scores, see "How to Read Better and Faster," on page 84 of FACTORY's October 1951 issue. If you've passed your copy along to someone else, write the Editor for a reprint.

Comprehension score: Just add up the percentage credits for each of the questions you answered correctly.

Speed score: Refer to your note of how long it took you to read the article. Convert the time into seconds. Divide the result by 10. This answer you divide into 1239 (number of words in the article). Finally, multiply this last result by 6. This will give you your reading speed in words per minute. (If you recorded your time in decimal minutes, you can get the result directly by dividing the time into 1239.)

Reading index: To find your reading index, multiply your speed in words per minute by your percentage of comprehension and divide by 100. Do not figure reading index if your comprehension score is less than 75%. With lower comprehension, the reading index is not valid.

Now check yourself against this table of reading indexes: 400 or more (excellent); 300-399 (very good); 250-299 (good); 200-249 (fair); 150-199 (poor); below 150 (very poor).

Let us know how you came out on your reading score. A postcard will do—sign it or not.

ANSWERS TO TEST QUESTIONS

Q	A	Credit	Q	A	Credit
1	c	10	6	c	15
2	b	5	7	d	10
3	d	5	8	a	10
4	a	20	9	a	5
5	a	5	10	b	15

Now Make Floors Last Longer with ACME STEEL Floor Plate

Quick-to-install, skid-resistant, heavy-duty Floor Plate saves money

Here, at last, is the commercially proven product that answers your industrial flooring problems. Acme Steel engineers have designed a steel floor plate that combines the skid resistant characteristics of concrete with the durability of steel for floors subject to heavy traffic and abusive wear.

Each foot-square plate is anchored in concrete with one hundred prongs and flanged edges. Plate cannot work loose, weave or rattle. A unique grid, exclusive with Acme Steel, gives smooth, even surface.

And Acme Steel Floor Plate saves you money in four ways:

1. **Installation time is cut. (It takes less time to install than it does to trowel surface of an ordinary concrete floor.)**
2. **Floor lasts longer. (The wear on one floor after three years of constant wear was less than .0025 inch in a recent test.)**
3. **Waste is eliminated during installation. (Individual plates can be installed around posts and machinery without cutting.)**
4. **Under-floor repairs are quicker, cheaper. (Only plates on area over pipes or conduits to be repaired are removed. Plates over adjoining areas remain in place protecting concrete from chipping, cracking.)**

Ask your Acme Steel representative about your industrial flooring problems, or write Dept. FMM-13-F.

ACME STEEL COMPANY
2849 ARCHER AVENUE, CHICAGO 8, ILL.

Here's what one flooring contractor says about Acme Steel Floor Plate:

"We have had 100% satisfaction with Acme Steel Floor Plate. In fact it is the only floor steel that has worked out satisfactorily in our experience."

Christ Lundsgaard, Cement Contractor

ACME STEEL COMPANY
Dept. FMM-13-F
2849 Archer Avenue, Chicago 8, Illinois

Gentlemen: Please send me your free, new illustrated ACME STEEL Floor Plate folder that tells how to cut flooring costs. My name and address is:

NAME_____

ADDRESS_____

CITY, STATE_____

FREE booklet

answers 17 most frequently-asked questions about this label on industrial lighting units, such as:

Q What do the initials RLM stand for?

A The "R" stands for Reflector, the "L" for Lighting equipment and the "M" for Manufacturers—*Reflector* and *Lighting Equipment Manufacturers.*

Q How does the RLM Label assure conformance to RLM Standards?

A Representatives of the Electrical Testing Laboratories periodically visit the plants of all manufacturers participating in the RLM Specification-Certification Program. These ETL inspectors are authorized to take lighting units right off the assembly line or out of stock at random and make the required tests. They may also obtain test samples direct from distributors' stocks in order to check conformance to RLM minimum standards.

Q Who are the Electrical Testing Laboratories?

A Electrical Testing Laboratories, Inc., 2 East End Ave., New York 21, N. Y., is an independent testing organization which has conspicuously served industry for over 50 years. With this impartial and scientific organization rests the sole responsibility of determining whether or not an industrial lighting unit measures up to every individual quality standard that qualifies it to bear the RLM Label.

Q What are the 4 Basic Tests made by Electrical Testing Laboratories?

A (1) Quality of reflecting surface, (2) Reflection factor, (3) Shielding angle and reflector dimensions, and (4) Photometric test for light distribution and efficiency.

Q What does the RLM Label stand for?

A The label affixed to a lighting unit certifies that the reflector meets the minimum specification and performance standards, determined and established by the RLM Standards Institute.

Q Who sponsors the RLM Standards Institute?

A Incorporated as a non-profit organization, the Institute is sponsored by 28 manufacturers who voluntarily elect to manufacture industrial lighting equipment in accordance with RLM Standard Specifications.

Q How are RLM Standard Specifications established?

A The RLM Technical Committee, with the counsel of outstanding illuminating engineers, continuously reviews present specifications and suggests improvements and prepares new specifications. The Committee's recommendations then are reviewed by the Board of Trustees and finally submitted to the Institute Members for ratification. The adoption of new specifications requires approval by at least 80% of the membership.

Q In addition to design and construction features that meet certain minimum standards, what else does the RLM Label assure the buyer?

A It provides the buyer with a warranty of uniform quality. In addition to the periodical inspections and tests made by the Electrical Testing Laboratories, the manufacturer warrants that every unit shipped by him meets the published specifications of the Institute.

Q How many different types and sizes of RLM Units are there?

A There are 18 basic types of RLM Units made by one or more of the 28 member-manufacturers. At present there is available a total of over 320 different makes and types of units which either bear the RLM Label or are on submittal for testing and certification at Electrical Testing Laboratories.

Q How may I obtain free copies of all existing RLM Specifications and a check list of RLM-Member Manufacturers?

A Send for the 48-page RLM Specifications Book and the new Question and Answer booklet. Write RLM Standards Institute, Suite 829, 326 W. Madison St., Chicago 6, Ill. Your copies will be mailed without cost or obligation.

RLM STANDARDS INSTITUTE
INCORPORATED
The letters RLM stand for Reflector and Lighting Equipment Manufacturers

R5370RB

Save time... slash costs... switch to Black & Decker POWER!

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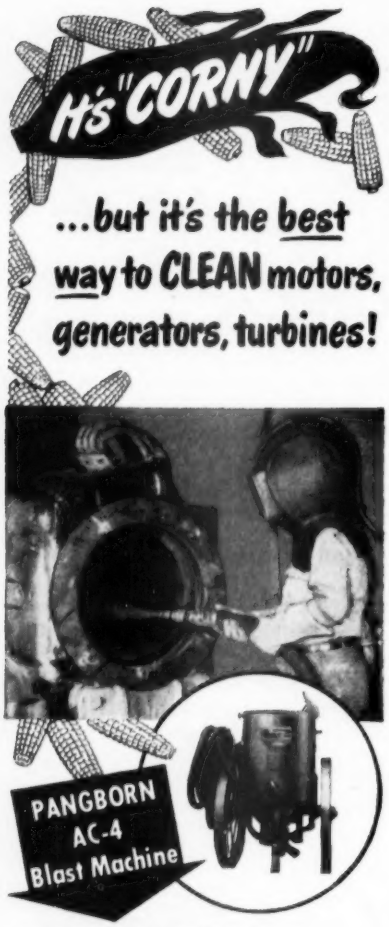

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BLAST CLEANS CHEAPER
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NAF—Training Ground for 50,000 Foremen

NAF stands for National Association of Foremen. It's *not* a union, though some executives mistakenly think it is. It's not any other kind of pressure group, either.

It's a big, growing organization of men who think good supervision is just about the most important thing on the industrial scene. It's worth knowing about, so here's the story of NAF.

BACK IN 1919, a group of 80 young shop foremen met one night to form what they called the Foremen's Club of Dayton (Ohio). They represented a cross-section of Dayton's industry, and shared one common objective: They wanted to learn more about the management of industrial plants. They invited Louis Ruthenberg, then general superintendent of the Dayton Engineering Laboratories (now chairman of the board of Servel, Inc., Evansville, Ind.), to lead them in a series of management conferences at the local YMCA. They liked their get-togethers so much that they didn't disband at the end of the year, as they had originally planned. Instead they formed a permanent organization. Six years later—in 1925—the idea had spread to so many other localities that a national association was formed—the National Association of Foremen.

It's a far cry, 27 years later, from the 80-man group that started NAF. Its present membership of 50,000, scattered over 37 states, includes men from over 1200 companies. Clubs range in size from the giant city-wide club in the parent city of Dayton, with 2700 members, down to many individual company clubs with just a handful of members.

Right now, NAF is growing by leaps and bounds. In 1952, for example, its membership leaped ahead by some 5000. In fact, the history of this organization's growth is an interesting parallel to the growth of active interest in improving supervision in American industry generally.

Thus, in its first 17 years of existence, NAF grew slowly indeed—from 3360 members in 1925 to 6000 in 1942. Then came the great war-time spurt, which hasn't slowed down yet.

There's a reason for the slow early growth of NAF. Here it is, in the pungent words of Dr. James E. Bathurst, executive vice president:

"For many years, the NAF was looked upon by top management as being a sort of 'lice dip' association, where top management could periodically disinfect their foremen from infectious leanings toward various types of organized-labor groups for foremen. But now management looks to us as a maker of leaders in the management field. That is all we ever thought we were or hoped to be."

WHAT IT IS

The NAF identifies itself as an educational, non-profit, non-political association, open to affiliation by all men who are employed in jobs of management. There are three objectives; (1) better qualified leaders among management; (2) unity among all segments of management; (3) preservation of the free enterprise system.

Turn the page

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TRAINING GROUND FOR FOREMEN

Begins on page 290

The key to all these aims, NAF insists, is education. Every club, regardless of size, is required to devote most of its effort to developing a well-rounded management-training program.

"No organization can affiliate with NAF just because it wants to," says Executive V. P. Bathurst. "It must prove to the association's board of directors that it is at least 75% educational in function. The NAF refused affiliation to 27 clubs in 1950, and dropped 29 more because they failed to meet the educational requirement."

THE UNION QUESTION

Despite its years of successful operation, the NAF is still plagued by the tendency of many management men to think it is a "foremen's union." Dean Sims, aggressive editor of *Manage*, NAF's official magazine, puts the problem like this:

"Despite NAF's record over the past 27 years, some industrial leaders still ask fearfully, 'Are you organized labor?'

"We always answer the same way: 'No, a million times NO.' Then comes the sure-fire second question, "Well, then, are you *anti*-organized labor?'

"'We are not anti-anything,' comes back NAF. If organized labor builds the individual member to his own benefit and that of his employer, then we're for organized labor. We do not condemn all of organized labor because of the much-publicized abuses of the system by many.

"We also are often asked whether NAF uses its membership for collective bargaining, too. The answer again is a flat no. We are *management*—not organized labor. We are on the management side of the fence, clearly and deliberately. But we *do* think that getting along with organized labor has to be a give-and-take proposition.

Turn the page

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Plant engineers have discovered that the Basket, extremely light and remarkably strong, is also perfectly adapted to all-'round use as a tote-box—usable from storage to stockroom to shipping dock.

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Now small parts may be readily routed through *every* plant operation in one container . . . which serves as a flexible stockroom fixture, may be transported tiered or nested, travels safely by roller or overhead conveyor, by trucks or on pallets, or may be carried easily by hand. Requires a minimum of storage space, presents a neat and orderly appearance, both nested and tiered.

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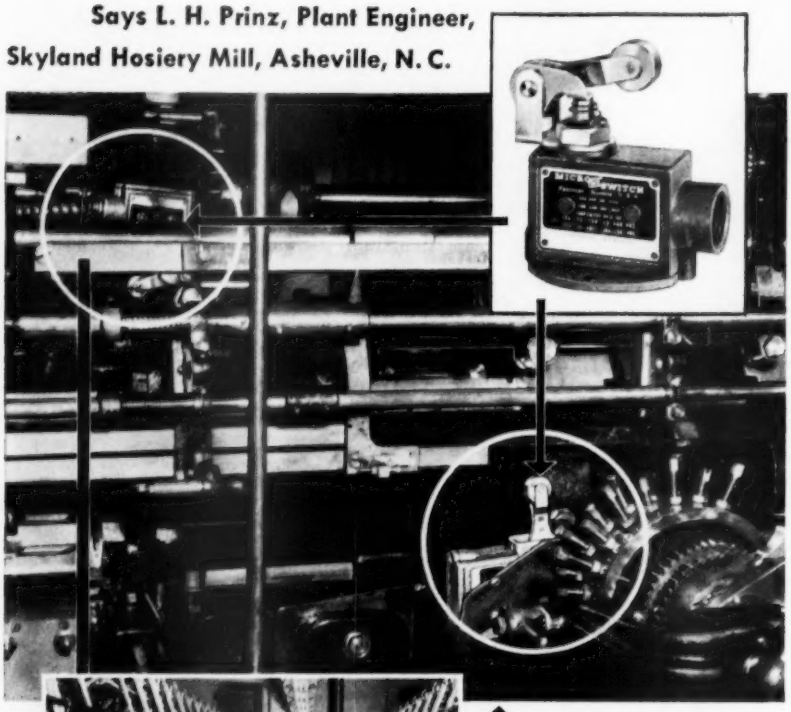
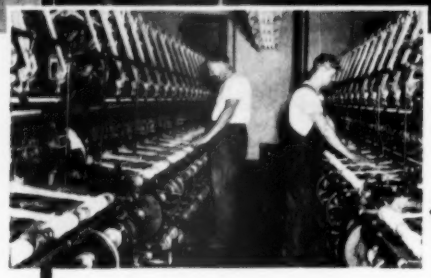
MATERIALS HANDLING ENGINEERS write today for bulletin giving full particulars.

"Since installing these two MICRO switches we have had no record of needle breakage"

Says L. H. Prinz, Plant Engineer, Skyland Hosiery Mill, Asheville, N. C.





Close-up view of the two MICRO switches installed on the carrier rack at the Skyland Hosiery Mill, Asheville, N. C. The switch at the upper left cuts off current in case of misadjustment of the carriage. The lower switch shuts off power if narrowing fingers endanger the needle bed.

View of portion of the Skyland Mill showing plant equipment that has been made safer and more automatic by the use of MICRO precision switches.

● Not only have these MICRO switches prevented needle breakage but, according to Mr. Prinz, they have also reduced the danger of jams on the carrier rack that can cost from $500 to $2000 to repair.

Skyland's engineer installed one switch on the carrier rack in such a way that it stops the machinery at once in the event of any misadjustment or mechanical failure on the part of the carriage. The other switch acts to stop the machinery if the narrowing fingers approach each other so closely as to tear up the needle bed.

Plant engineers in every industry are daily finding more and more uses for MICRO switches as limits, safeties and interlocks to make existing equipment more automatic and more productive.

There is a MICRO authorized distributor located near you with a wide variety of MICRO precision switches from which to select the switches best suited to your equipment needs. Micro engineering service is also available at nearby branch offices to help you solve your switch problems.

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TRAINING GROUND FOR FOREMEN

Begins on page 290

"It takes some executives quite a while to catch on to what we're driving at. But when they do catch on, NAF is nearly as close to their business lives as their families are to their home lives."

THE NAF ORGANIZATION

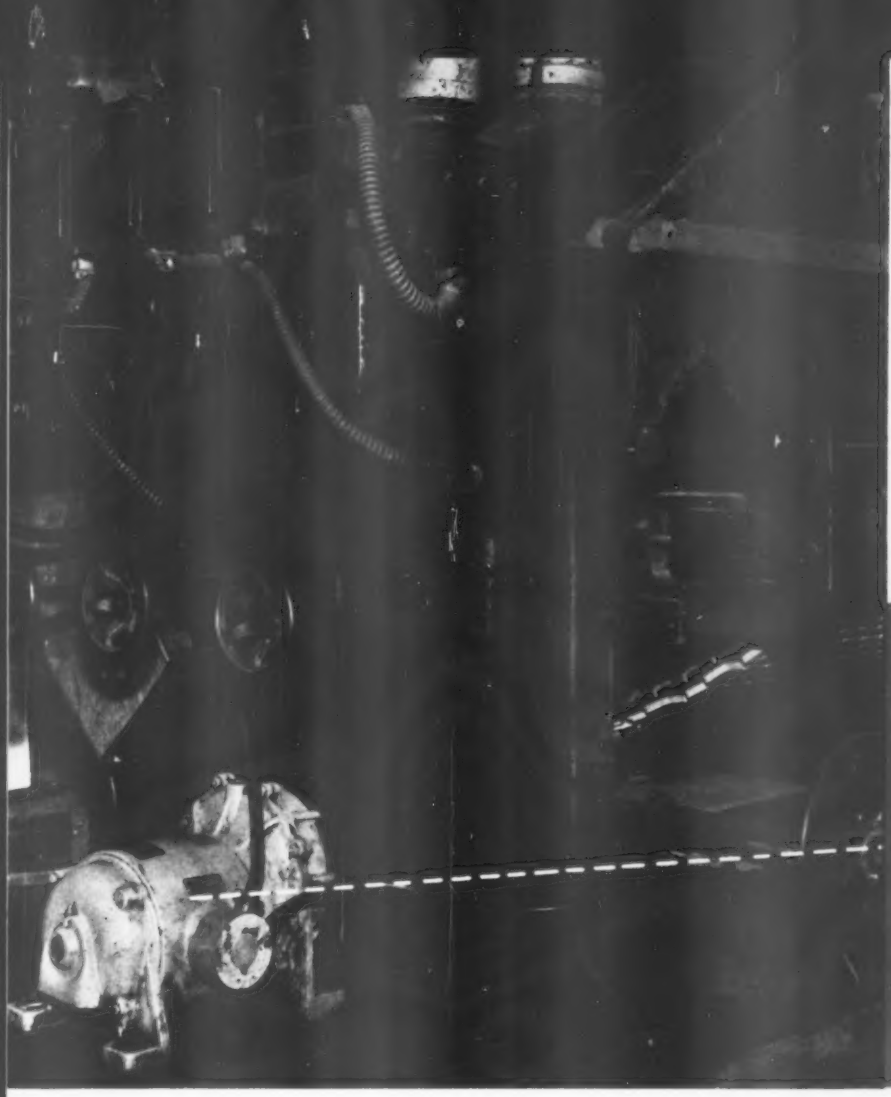
Despite its heavy growth in recent years, NAF has done a good job of preserving a remarkably democratic organizational set-up. The price—large, sometimes unwieldly representation—is not high, in NAF's opinion.

The national board of directors, for example, currently numbers 120 men, and annually increases in size as the organization grows. This group meets three times a year, and is the top governing body of the association. In addition, there are eight zone vice presidents, a national president, a first vice president and a secretary—all elected annually by the membership.

The national headquarters is headed by an executive vice president and a full-time, paid staff of 15. The country is divided into five areas, with an NAF field manager for each. It is the area manager's job to service all NAF-affiliated city and industrial clubs. At present, area managers work out of Los Angeles, St. Louis, Chicago, Dayton, and Pittsburgh. But rapid growth is forcing NAF to begin planning to enlarge its area representation, to provide more men to help clubs shape their educational programs.

MEMBERSHIP POLICY

NAF is unusual in its attitude toward enlarging its membership. It has never been a "high pressure" organization in seeking members, and insists that it has never once in its history made the "first approach" to an industrial executive to encourage his company's affiliation with NAF. This is a deliberate part of the organ-



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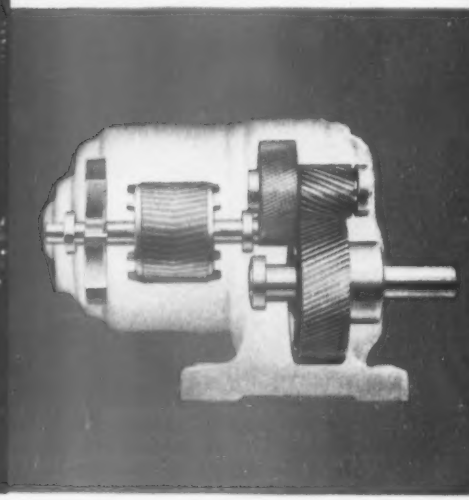
The Slo-Speeds that have been installed on our synchronized dual conveyor system and Solem Sander have resulted in reducing tremendously our maintenance costs as well as power consumption through a reduction of horsepower ... the conveyor system, originally designed for two motors, is driven satisfactorily by only one Slo-Speed, and a 2 H.P. Slo-Speed replaced a 5 H.P. motor of another make on the sander, reports E. Douglas Johnson of Higgins, Inc., New Orleans.



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TRAINING GROUND FOR FOREMEN

Begins on page 290

ization's policy. "We always wait for the company to make the first move," says Dr. Bathurst. "It's not in keeping with our general personality to employ high-pressure salesmanship to increase our membership."

WHAT'S AHEAD FOR NAF?

Dr. Bathurst doesn't know whether the present fast growth will continue. He hopes not, actually is thinking about trying to slow down the rate of growth. That's an odd-sounding approach, but Bathurst means what he says: "Intimate personal understanding and cooperation have been the foundation of our concrete growth and success. We will not lose that. And we will start turning down eligible clubs before we do."

TOO GOOD TO BE TRUE?

Bathurst somewhat ruefully reports that for the past 10 years newspaper and magazine writers have taken brief looks at NAF, then backed away.

"What's wrong with us" he asked a newspaper feature writer.

"Frankly," said this seasoned journalist, "I can't figure out the NAF. It ain't 'agin' anything, and it ain't *for* anything—except Americanism. I don't see what holds your membership together."

"It's the NAF spirit," Bathurst started to explain, "men of management working together for better understanding and all the good that can be derived from it."

The reporter smiled dubiously and said, "Now surely there's more to it than that. Somebody must be making a lot of dough off these foremen, or the NAF has some concealed axe to grind."

Bathurst gave up, walked away shaking his head.

And that seems to be just about the story: The NAF has appeared to be too good to be true. But there it is, plugging ahead, growing steadily, doing a job.

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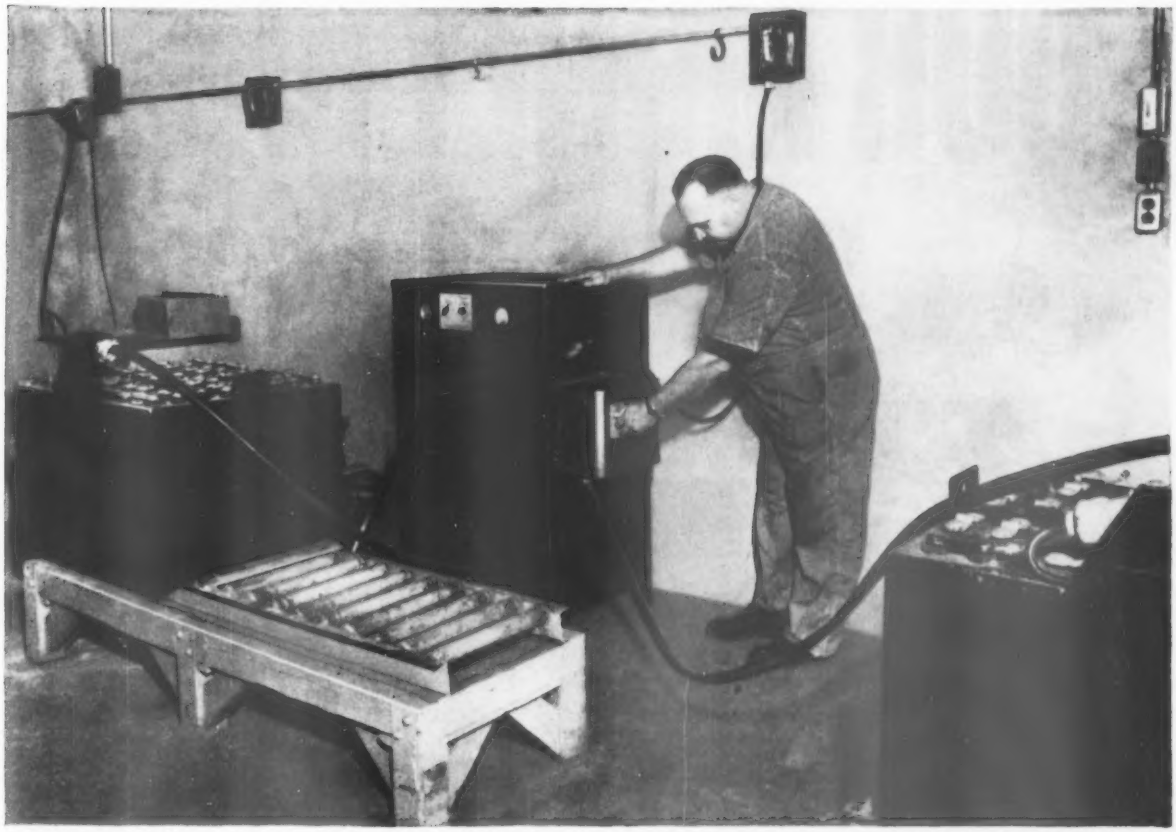

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G-E Charger with Sequence Charge Control cuts costs; charges two batteries at once

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"For our driver-ride lift trucks, I have proved that there is no finer equipment than G-E Metallic Rectifier Chargers," reports L. M. Spraker, Materials Handling Engineer, Beech-Nut Packing Co., Canajoharie, N. Y., "and I double the capacity of G-E Chargers with G-E Sequence Charge Control."

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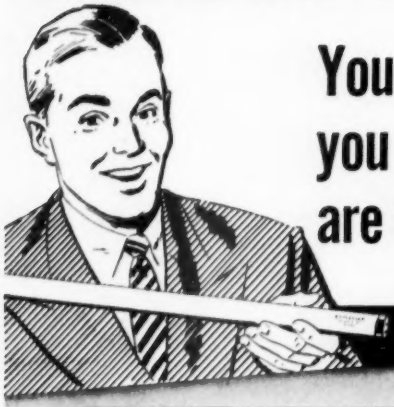

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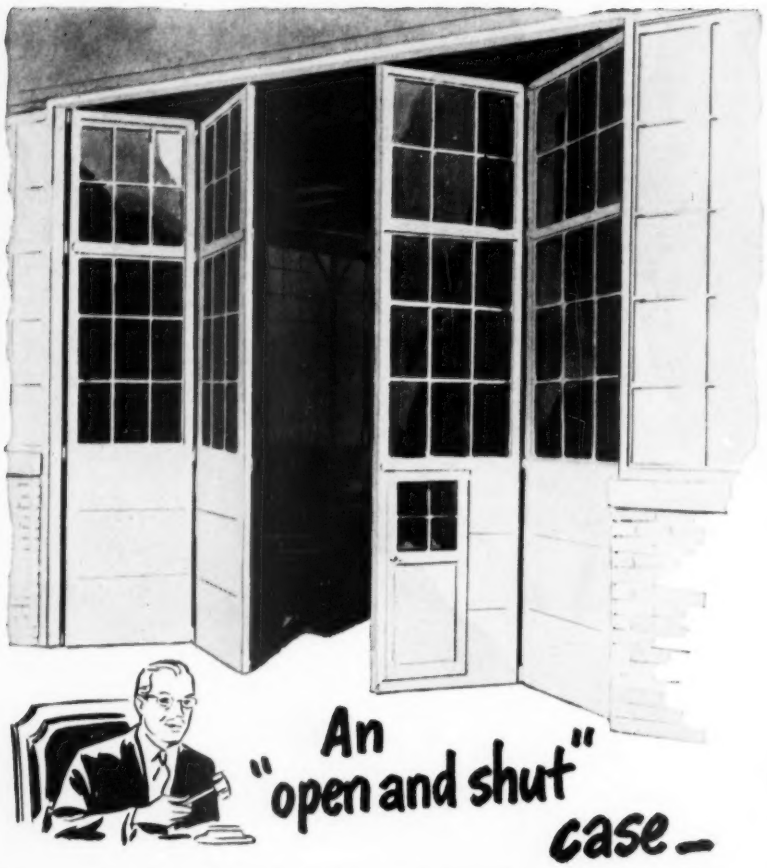

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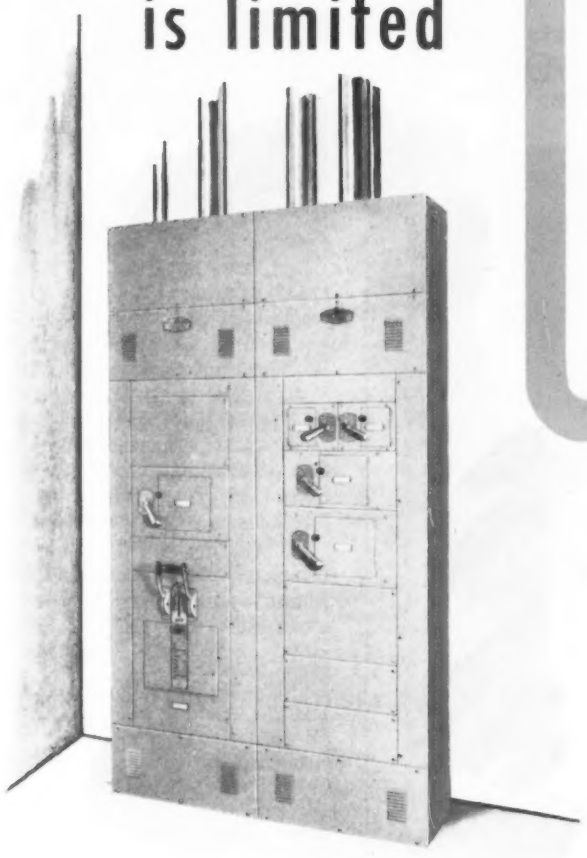
where space is limited



The Ⓕ Switchboard, Front-Connected illustrated here is 54" x 96" x 14½" and contains two (2) 60 Amp., one (1) 100 Amp., two (2) 200 Amp., and one (1) 400 Amp. 3 P. Shutlbrak Switches; also space for two (2) 100 Amp. and two (2) 200 Amp. future switches.

Ⓕ **Switchboards, Front-Connected** are available in the following types and capacities:

SHUTLBRAK — 30 to 1200 amperes, 250 volts AC or DC and 600 volts AC. Rotary type operating handles furnished on 30 to 200 ampere capacities. Straight handles on all others.

KLAMPSWITCHFUZ — 30 to 600 amperes, 250 volts AC or DC.

SNUFARC — 30 to 200 amperes. 600 volts AC.

INSTALL FA TRADE MARK SWITCHBOARDS front-connected

Like all Ⓕ Switchboards, these space-saving boards are built from standard, pre-assembled units that fit readily together to form one complete assembly.

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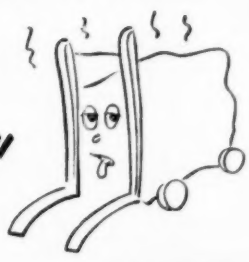

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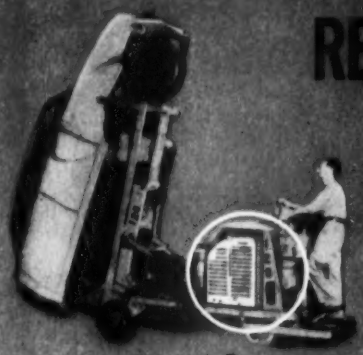

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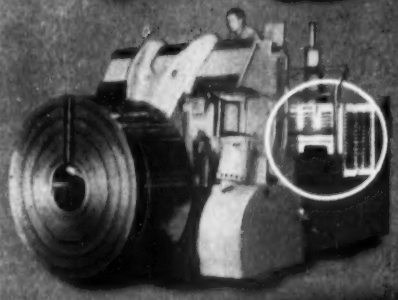

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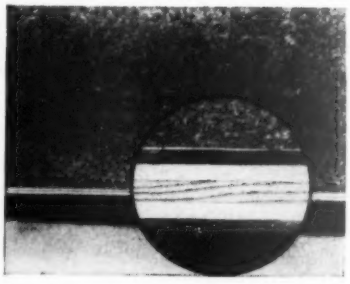
NEW MATERIALS

Begins on page 300



PRESPLY, a panel made of Presdwood over a plywood core, is announced by Masonite Corp., 111 W. Washington Ave., Chicago 2. Features strength and rigidity that make it ideal for work surfaces, materials handling chutes, and pallets. Available in 4x8-ft. panels in ½-, ⅝-, and ¾-in. thicknesses.

COLORED UREA MOLDING COMPOUND that answers the need for a thermosetting plastic for large moldings is being produced by Plaskin Div., Libbey-Owens-Ford Glass Co., Toledo 6. Material is non-electrostatic, high in dielectric strength, scratch resistant, and non-combustible.

WIPE AWAY STATIC ELECTRICITY on many plastic, rubber, and synthetic fiber products with a chemically treated material developed by Globe Laboratories, Sherman Oaks, Calif. You can get the material, called De-Stat Cloth, in 18-in. squares. Maker says it lasts indefinitely if you keep it clean.

DYNEL-MAT—multilayer webs of compacted Dynel fibers—is being produced by The Felters Co., 210 South St., Boston. High resiliency, resistance to chemicals, fungi, and insects make it suitable for lining, cushioning, and filtering uses involving severe exposure conditions. And Dynel-Mat is thermoplastic. Comes in rolls in any thickness from 1/100 to ¼ inch.

Why $12,000 to $20,000 Jobs Are the Easiest to Get Today

Here Are Some Surprising Facts About the Serious Shortage of High-Salaried Executives—and What You Can Do to Qualify for the Top-level Jobs That Are Open Right Now

SURPRISING as it may seem, the really big jobs today are the hardest to fill—and the easiest to get. You don't have to look farther than the want-ad columns to prove this fact for yourself. Men who can handle top-management jobs can now choose from any number of openings that pay $12,000 . . . $15,000 . . . $20,000, and more.

Such men are becoming hard to find. WHY? The acute shortage has been variously explained by the war years, the rapid expansion of industry, the tendency to specialize. The important thing is not why the shortage exists but WHAT you can do about it, and HOW you can qualify for the great opportunities that exist in business today.

As one of the foremost business consultants in the U. S. and the head of a large accounting firm, J. K. Lasser works with some of the nation's leading corporations. He has seen at first hand the scarcity of qualified men for high-salaried jobs. Why, Mr. Lasser asked, are there so many openings at the top—and so many men stymied in the $5,000 to $10,000 a year bracket?

The One Ingredient That Qualifies You for a Top-Salary Job

To find the answer, Mr. Lasser went directly to the heads of companies in many fields. Consistently he heard the same answer: the one thing men in the middle brackets need to make the high-salary grade is—a general, well-rounded knowledge of business procedure. "Give me a man with a basic knowledge of accounting, marketing, employee relations and taxation," one employer remarked, "and I'll lead him by the hand to a $20,000 office!"

J. K. LASSER

Featured in FORTUNE MAGAZINE as one of the nation's foremost authorities on business and taxes. Mr. Lasser is head of one of the best known accounting firms in the United States and Adjunct Professor and Chairman of the Institute on Federal Taxation at N.Y.U.

This simple answer gave Mr. Lasser an idea for a brand-new plan that would literally lead men out of the $5,000-$10,000 plateau and into the top jobs. He asked the foremost men in every field to reveal working methods that have brought success in marketing, public relations, accounting, budgeting, insurance, government regulations, taxation, and the "know-how" in every business procedure for top-level management.

Mr. Lasser consulted only top men, such as business analyst Roy A. Foulke, Vice President, Dun and Bradstreet; marketing expert Marion Harper, Sr.; twenty executives nationally known for their successful methods. Then he simplified and "boiled down" this wealth of knowledge and experience into J. K. Lasser's Executive Course in Profitable Business Management—providing the all-important ingredient needed to boost men into the $10,000-plus bracket!

What You Can Learn from These Successful Executives

Lasser's Executive Course makes it possible for you to view each departmental operation from the top down, with an expert as your guide. You learn to talk, think, and plan with the kind of well-rounded authority expected of top-management.

You learn streamlined methods of distribution; how to run a cost system; how to design systems for internal control of business. Even hardboiled employers will be impressed by your knowledge of controlling operations through budgeting; how to avoid business frauds; and how to cut paper work in half. Your knowledge of new marketing methods, successful tax planning, and effective management under today's government controls can save and make money for any employer.

Are You READY for Advancement?

If you're not *sure* of your own advancement, send for Lasser's Course right away. By looking at the whole Course—noting the ground covered, the fact-filled treatment, Lasser's clear, informative style—you can quickly see how this Course can prepare *you* for advancement—back you up with the best ideas of 21 leading business experts.

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NOTE TO EMPLOYERS: Mr. Lasser's new course is designed to help solve your problems in readying men for top-level openings in your organization. Send us the names and addresses of men working for you who merely need more background in sound business procedures to qualify them for bigger jobs. We will gladly mail a booklet to them, fully describing the course, without charge or obligation to you.

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BOOKS

For All Plant Executives

PROGRESS IN PRODUCTIVITY AND PAY, 1914-1947

Prepared and published by the Eddy-Rucker-Nickels Co., Harvard Square, Cambridge, Mass. Statistical tables, charts. 72 pp. $2.50.

This is perhaps the most important collection of factual information about productivity and pay in U. S. manufacturing industries ever to come down the pike. It is a reference "must" for every executive who wants to know what has been going on in manufacturing the past 40 years.

You may want to question the *analysis* that accompanies the data in this neat little spiral-bound volume. In a sense, the purpose of the analysis (and reason for publishing the book) is to "justify" the "Share-of-Production Plan" of the Eddy-Rucker-Nickels consulting firm. (For more about the plan, see FACTORY, November 1947, page 74, and November 1948, page 102.)

But the basic data are unassailable: All are taken from the U. S. Department of Commerce's Census of Manufactures. So there's nothing particularly new about the data. The real service this book provides is to bring together, in compact form, material that would require searching through thousands of pages of census reports.

The six pages of "summary table" give you, for each census year, the following data:

1. Productivity (value added by manufacture) per man-hour and per man-year
2. Pay (worker earnings) per man-hour and man-year
3. Labor's share of production (or value added)

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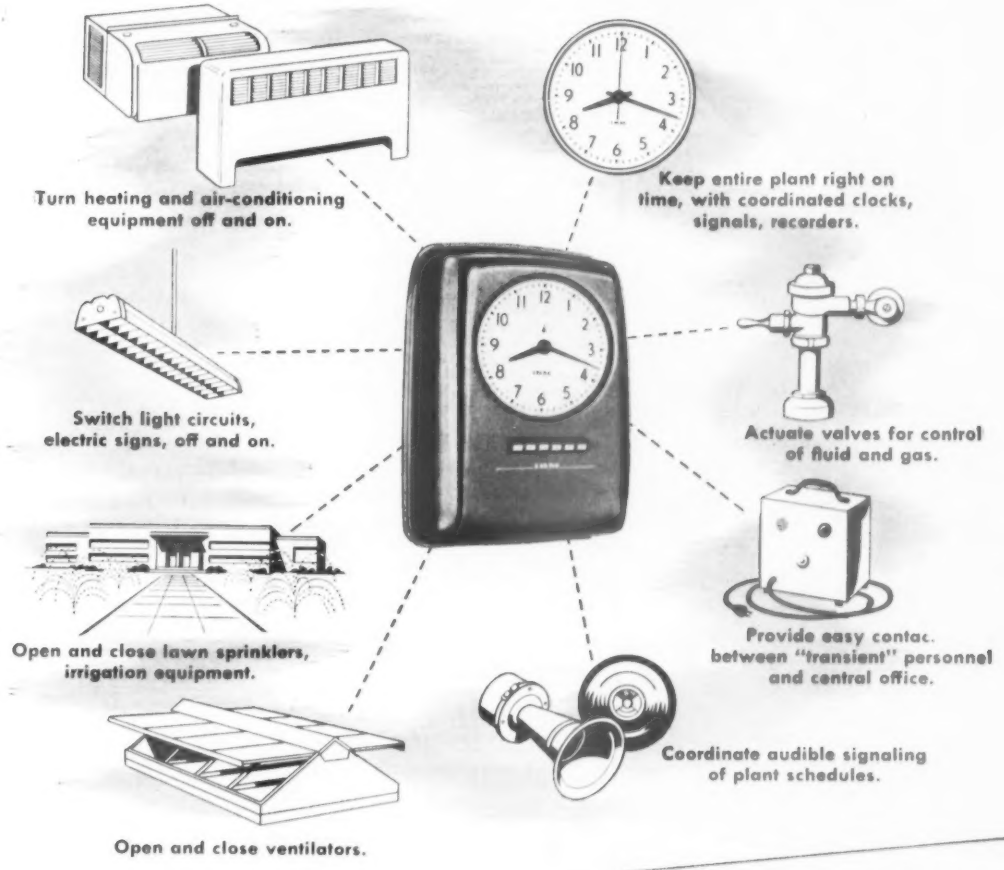
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BOOKS

Begins on page 304

4. Prices of manufactured goods (BLS index, and prices relative to hourly wages)
5. Electrical energy used by manufacturing (total and per wage earner)
6. U. S. population
7. Factory production workers (total, and per 1000 population)
8. Man-hours worked (total, and per worker per year)
9. Production value of manufacturing output (value added) (total and per person for the entire population)
10. Purchasing power of annual wages (for manufactured goods, and for all consumer items)

To make interpretation of the statistics easy, all money figures are given in both "current" dollars and "constant" (1929) dollars. Percent changes between censuses, and percentage annual growth rates are also shown.

Ten appendixes in the book give complete references to the source of all information, make it easy for you to locate additional statistics on, say, your particular industry.

The point emphasized in the book is this: Good times or bad, labor's share of production has been between 37.7% and 41% of the dollars of value added by manufacture. Within that range, the correlation between annual wages and annual value added by manufacture is 0.9996 (1.00 is perfect correlation).

But even if you have no interest in "labor's share," you'll find this book a gold mine of statistics on manufacturing and references on where to find additional authoritative data.

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Customer Reports:

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JACUZZI BROS., INC., Richmond, Calif., had heavy losses due to rejects of pump bearings made from sand-cast bronze.

"Since switching to ASARCO Continuous-Cast Bronzes (75% Cu, 5% Sn, 20% Pb, and 83% Cu, 7% Sn, 7% Pb, 3% Zn), REJECTS ARE NEGLIGIBLE, and there have been no field failures," says Mr. R. Delahay, Jacuzzi production engineer.

Here's why ASARCO Continuous-Cast Bronzes cut rejects: porosity, dirt, hard and soft spots are non-existent; alloy constituents are uniformly distributed. Also, dimensions are held to close tolerances: +0.004" to −0.006" on O.D., and tube concentricities to within 1.5% of wall thickness. Fatigue and impact characteristics are up to 100% better than those of sand-cast or permanent mold stock; tensile and yield strengths are appreciably higher. All stock for machining is Medart-straightened.

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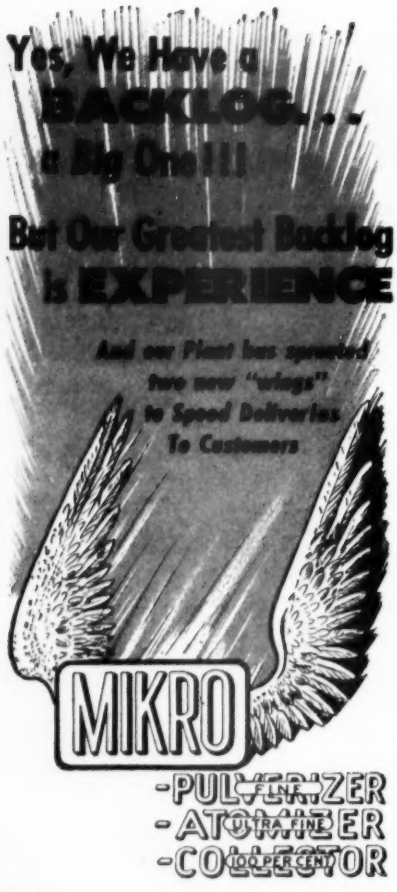

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Twenty-eight years on one job add up to a lot of savvy, but they don't necessarily mean hardened arteries or long whiskers. An industrial organization is as young as its dynamic enthusiasm. We haven't stopped growing. Recently we built two wings increasing production facilities by 25%.

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BOOKS

Begins on page 304

For Personnel Executives

THE EMPLOYMENT INTERVIEW IN INDUSTRY

By Newell C. Kephart. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36. Tables, charts, references. 277 pp. $4.50.

Your problem: to match the right man with the right job. And you rely upon interviews more than any other device for your hiring decisions.

The author's approach to your problem is based on the fact that modern selection procedures demand that you rely less on intuition and more on knowledge and established facts.

He shows how newer techniques, like personnel tests, job analysis, and controlled studies of worker characteristics and job success, do not replace the interviewer but rather increase his value and add to his responsibilities.

The writer analyzes the areas of information where more study is needed. And he shows how the facts gathered from these sources can be integrated with the interview to produce the end product you're looking for—the right man for the job.

Book Briefs

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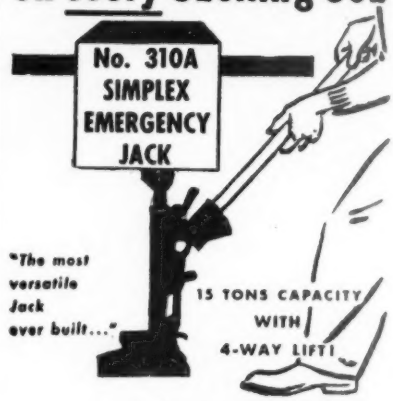

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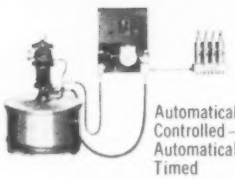

Automatically Controlled—Automatically Timed

Time clock controlled. Pumping unit supplies lubricant in measured quantities through injectors to all bearings at regular intervals.

Automatically Controlled—Manually Timed

Operator manually starts the pumping unit which supplies lubricant in measured quantities through injectors to all bearings. Pumping unit shuts off automatically.

Maintenance is an intermittent operating function

- Its need is indeterminable . . . its occurrence unpredictable . . . its planning indecisive.

Lubrication is a continuing operating function

- Its need is imperative . . . its occurrence can be predetermined . . . its planning is therefore simple and positive.

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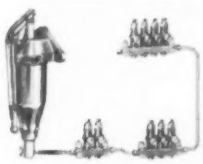
Hydraulic control valve on machine actuates the cylinder directing the action of the machine and simultaneously energizes and actuates the lubricant pump. The pump forces lubricant under pressure through the Supply Line to lubricant injectors.



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Industrial lubrication cannot be accomplished with infrequent attention, as is customary with maintenance practices. Practical lubrication, planned and utilizing an application system which provides the right kind of **CONTROL** over type and quantity of lubricant — as well as frequency of application — tends to abolish Preventive Maintenance, not perpetuate it.

Lincoln Catalog 80 describes many advantages of the 22 Centralized Lubrication Systems. Write for your copy.

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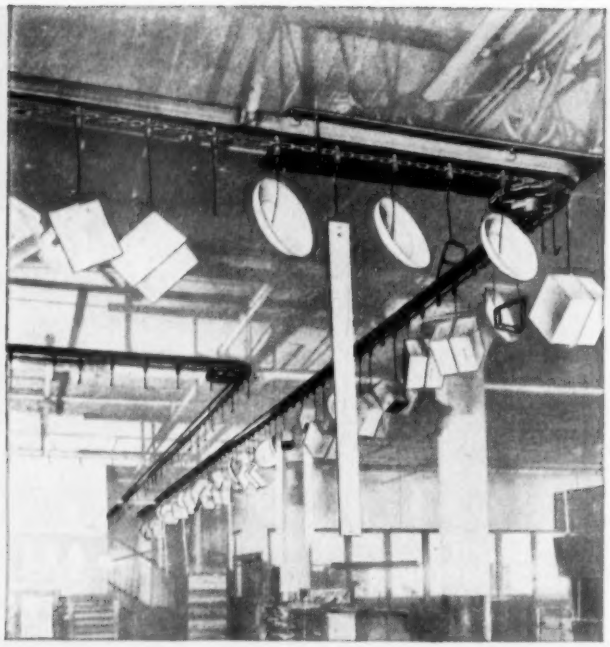

How to Build Your Own OVERHEAD CONVEYOR

You too can build your own power driven overhead, monorail conveyor. This 28-page booklet (Bulletin JM 2) tells you in detail how to make your lay-out, select the parts you will need and install them. All elements are fully illustrated—all sizes and capacities given.

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BOOKS

Begins on page 304

Industry. Also provides a registry service that keeps handbook owners up to date on new developments in the field. Available at Eastman Kodak dealers or write Eastman Kodak Co., Rochester 4, N. Y. $4.

CONCILIATION IN ACTION

A comprehensive statement of the principles of conciliation, intended as a working manual for the labor relations field. First section lays essential groundwork for discussion. Second section traces the factors that influence conciliator's role as the third party. By Edward Peters, conciliator, Calif. States Conciliation Service. National Foremen's Institute, Inc., New London, Conn. 270 pp. $4.50.

PERSONNEL INTERVIEWING

Practical ideas on every important function of your personnel department—from office layout to the exit interview blank. Includes recently developed non-directive and Chapple Chronograph techniques and a chapter on stress, group, and board interviews. By James D. Weinland and Margaret V. Gross. Ronald Press Co., 15 E. 26th St., New York 10. 416 pp. $6.

MATERIALS HANDLING

This second edition spruces up a good job of describing the fundamentals, principles, equipment, and methods that make up the materials handling story. Volume is well-illustrated; covers the subject from pallet construction to plant layout, organization, and management. By Harry E. Stocker. Prentice-Hall, Inc., 70 Fifth Ave., New York 11. 330 pp. $6.65.

Turn the page

"THEY SAY THAT SOME SHEAVES CAN EASILY BE MOUNTED IN ONE PIECE AND GIVE THE SAME SHAFT GRIP AS THE TWO-PIECE DESIGN
NO, CHARLIE... LISTEN- THE SHEAVE THAT GRIPS THE SHAFT TIGHTEST IS THE ONE THAT'S DESIGNED TO BE MOUNTED IN TWO PIECES!

FIGURE 1—TO MOUNT THE QD IN TWO PIECES you (1) slide the split hub on the shaft, (2) position it with the locking clamp-screw in the flange, (3) draw down on the set-screw over the key (QD exclusive) to prevent it from drifting, (4) slide the QD rim with its large taper bore opening up on the taper of the hub, (5) draw up on three heavy hex-head pull-up bolts for a tighter grip than you get with any other sheave.

FIGURE 2—TO MOUNT THE QD AS A UNIT where a Woodruff key is used in a shouldered shaft, you (1) locate the loosely assembled hub and rim of the QD sheave against the shaft shoulder and (2) draw up on the three heavy hex-head pull-up bolts. That's all there is to it. And you haven't sacrificed any grip on the shaft. For removal, you simply use pull-up bolts as jack bolts in specially tapped holes.

Let's settle this one RIGHT NOW!

You can't have your cake and eat it too.

A one-piece sheave assembly may grip the shaft sufficiently tight for average use, but it *won't keep the shaft key from drifting*. Your answer to this problem lies in an *exclusive* key set-screw in the hub of the *two*-piece Worthington QD* Sheave. The set-screw is tightened with the hub on the shaft before the rim is slipped on (figure 1).

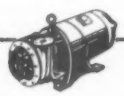
Of course, if you use a Woodruff key in a shaft with a shoulder, drifting of the key is no problem and you then can mount the Worthington QD assembled in *one* piece *without any sacrifice of its famous friction-cone grip* (figure 2).

WORTHINGTON'S COMPLETE LINE OF MULTI-V-DRIVES includes QD sheaves in all sizes, QD Juniors and other fractional horsepower V-pulleys, as well as Worthington-Goodyear V-belts. Your distributor has complete stocks backed by the largest factory stocks you'll find anywhere. Write for Bulletin V-1400-B7F to Worthington Corporation, Oil City, Pennsylvania.

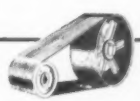
*Reg. U. S. Pat. Off.

MV.2.7

COMPRESSORS: AIR-COOLED, WATER-COOLED



PUMPS: CENTRIFUGAL, ROTARY, STEAM, POWER



MULTI-V-DRIVES: QD SHEAVES AND V-BELTS

VARIABLE SPEED DRIVES: ALLSPEED DRIVE, ALLSPEED MOTOR DRIVE

WORTHINGTON

Multi-V-Drives

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HAVE YOU TRIED THIS FINEST OF PLASTIC TAPES?

PLYMOUTH PLASTIC *Electrical* TAPE

PACKED INDIVIDUALLY
One 66-ft. roll, ¾" width in single pocket-size metal can

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Five 30-ft. rolls, ¾" width in handy container

RECOMMENDED IN PLACE OF FRICTION AND RUBBER TAPES IN THE FOLLOWING SITUATIONS:

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3. Where tape is subject to water, acids, alkalies, corrosion (resists all).
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Revolvator Go-Getter — telescopic straddle type lift truck — a bear for work in crowded areas, narrow aisles. Fully automatic — extraordinarily maneuverable 200° turning arc — 2500 lb. capacity — very slight operator training necessary. Write for full details of this and many other models.

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BOOKLETS

Begins on page 304

For All Plant Executives

BUSINESS SURVIVAL IN THE FACE OF ATOMIC ATTACK

By Mervyn Molloy. Special issue of the Systems and Procedures Quarterly. Systems and Procedures Assn. of America (Att: D. K. Titus), 17 E. 49th St., New York 17. Illustrations, charts, tables, selected references. 102 pp. $3.

Are you ready?

Even though a bomb does not fall in your section of the country, are you prepared for its secondary effects—supplies cut off, lost markets, disrupted distribution, legal complications, insurance problems, and long-range planning?

Can you answer these questions right now:

What should the president of your company do?

Where do your chief engineer, purchasing agent, controller, personnel man, and auditor fit in?

What is the role of each of your supervisors—and how is it made clear and effective?

How effective will your coordination of inter-departmental planning be?

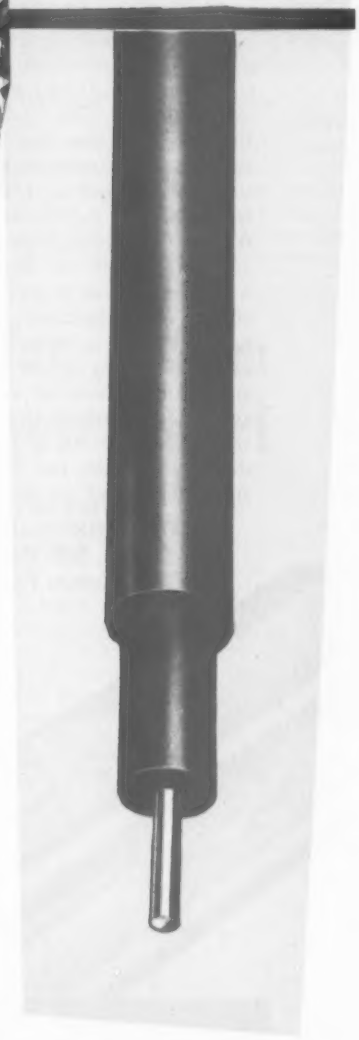
This booklet gives you a realistic approach to the probable answers. The author does not offer a detailed plan, since each company's procedures must be tailored to fit its own needs. But he attempts to give you a quick grasp of the atomic threat to industry by translating the technical aspects of the problem into the plant man's own language and practical thinking.

Mr. Molloy puts the atomic problem on your desk in plain talk. And he does an effective job of putting you on talking terms with the atomic security planning experts.

Turn the page

One phase of final inspection is the electrical testing, under water, of every foot of Rome RoZone. When the safety gate is lowered, high voltage current is applied to each reel of cable.

8 AWG solid street lighting cable, RoZone insulated with RoPrene (Neoprene) sheath—2001 volts and up.



Rome RoZone®

Superior Ozone-Resistant Insulation Deserves Your CONFIDENCE

What Its Uniformity Means to You...

Q: What is meant by uniformity?

A: Uniformity in service performance . . . foreknowledge of dependability, carrying with it the assurance that every length of RoZone insulated cable measures up to the same high standard of quality.

Q: Of what advantage is such uniformity?

A: Every time you install RoZone, you can be sure of identical performance under comparable service requirements.

Q: How does Rome Cable control uniformity?

A: By carefully supervised workmanship, backed by rigid manufacturing specifications and long experience in the exact compounding of quality insulation.

Q: How do we measure uniformity?

A: Through long-time laboratory and service tests, as well as a specially developed ionization level test which actually predetermines the insulation's behavior in service. Further, sampling tests for ozone resistance, electrical stability in water and aging properties are standard procedures.

In short, RoZone is a premium insulation, precisely compounded, manufactured on modern equipment, time-proven in service and step-by-step tested for high *uniformity of quality. It deserves your fullest confidence.*

It Costs Less to Buy the Best

RoZone is approved and accepted by leading utilities, industrials and consulting engineers

ROME CABLE
Corporation
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and
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SAVE MACHINE TIME • • MONEY • • • USING JOHNSON UNIVERSAL BRONZE

THESE bronze bars have many uses, particularly where their free machining properties are important. Many manufacturers find Johnson Universal Bronze ideal for certain gears and pinions, guide rollers, sheaves, trolley wheels, tips for air tools, washers, thrust plates, as well as for bushings and bearings. The cost per pound is offset many times by the low cost of machining. Non-sparking properties and corrosion resistance recommend it for certain uses. Another big advantage is that Johnson Universal Bronze is available from distributors' stocks, fully machined, in solid bars 5/8" to 8" diameters and in cored bars from 1/2" to 7 3/4" inside diameters—in all, over 400 sizes. Also available in hexagon bars from 5/8" to 3" outside diameters. Each bar is usable from end to end, no waste.

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512 So. Mill St.
New Castle, Pa.

JOHNSON B BEARINGS
Sleeve Type

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BOOKLETS

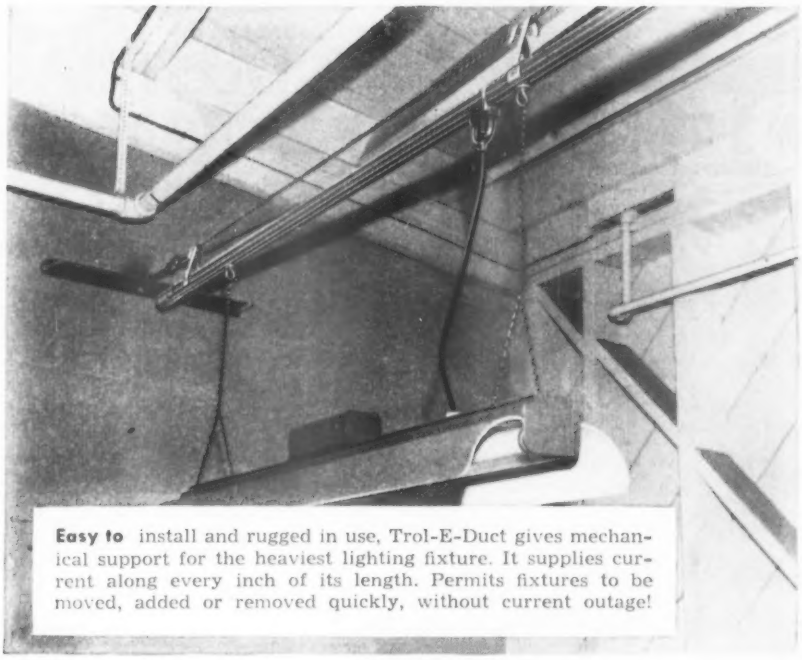
Begins on page 304

CURRENT PROGRESS IN HUMAN RELATIONS IN INDUSTRY. Industrial Services, Young Men's Christian Assn., Association Press, 291 Broadway, New York 7. Proceedings of the Thirty-Fourth Silver Bay Conference on Human Relations in Industry held at Lake George, N. Y., July 16-19, 1952. Includes discussions on latest findings in human relations research, trends in employee benefits, wage and salary controls. 109 pp. $1.75

INSTALLATION, OPERATION, AND MAINTENANCE OF CHAIN DRIVES AND CONVEYORS. Chain Belt Co., 1600 W. Bruce St., Milwaukee 4. How to get more for your chain-dollar. Hits the high spots in chain care and maintenance and packs plenty of information into a small, well-illustrated booklet. 31 pp. Free.

PENSION PLAN POLICIES & PRACTICES. By Michael Puchek. N. Y. State School of Industrial & Labor Relations, Cornell Univ., Ithaca, N. Y. Results of an impartial study of pension plans in 11 firms in Western New York State. 62 pp. 25¢. Free to residents of New York state.

WOOL FELT, COMMERCIAL STANDARD 185-52. Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. The first commercial standard for wool felt. Results of a joint effort by manufacturers, distributors, and users of wool felt, the National Bureau of Standards, and the Department of Commerce. Makes a valuable addition to your reference information on standards of materials. 23 pp. 10¢.



Easy to install and rugged in use, Trol-E-Duct gives mechanical support for the heaviest lighting fixture. It supplies current along every inch of its length. Permits fixtures to be moved, added or removed quickly, without current outage!

Wherever an electric hand tool is used, it needs mobility. BullDog Universal Trol-E-Duct provides complete mobility with trolleys that roll on steel wheels, furnish power as they roll! Trol-E-Duct is enclosed at top and sides, requires no cleaning or maintenance.

Here's a really versatile lighting system you can quickly install with a screw driver!

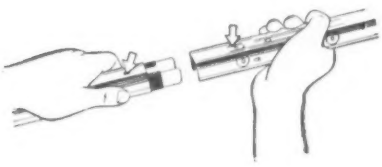
Completely salvable . . . meets tomorrow's lighting needs as well as today's!

Universal Trol-E-Duct is completely prefabricated for highest flexibility, quick, easy installation. Interchangeable sections allow it to be dismantled and installed elsewhere at any time without so much as a single scrapped part. Only tool needed is a screw driver!

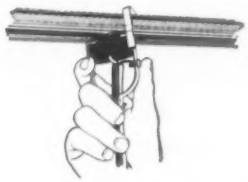
Here's industrial and commercial lighting at its very best! Rigid steel duct encases solid-copper bus bars. Through these bars Universal Trol-E-Duct delivers current at any point along its entire length.

Twistout tap-off plugs insert anywhere in the duct with a twist of the wrist. Connections are made and broken without cutting off the current!

This modern, low-cost lighting system will solve your lighting-outlet needs, present and future. Write today for information-packed Bulletin B-650, or get complete details from your nearby BullDog Distributor.



Quickly installed. Sections go up in a hurry, join without bolting. Sections are prefabricated, standardized in lengths of 5 and 10 feet. Entire duct can be dismantled and reinstalled easily without a scrapped part.



Convenient. Lighting twistout plugs slip into duct without cutting power or upsetting production schedules. Plugs ground on steel casing before contacts touch bus bars, slide in with a twist anywhere along duct.

Mobile Trolleys. Smooth-rolling trolleys are available to carry small, portable power tools, speed up production. Trolleys ride on track inside duct. Constant spring pressure against bus bars assures perfect contact.

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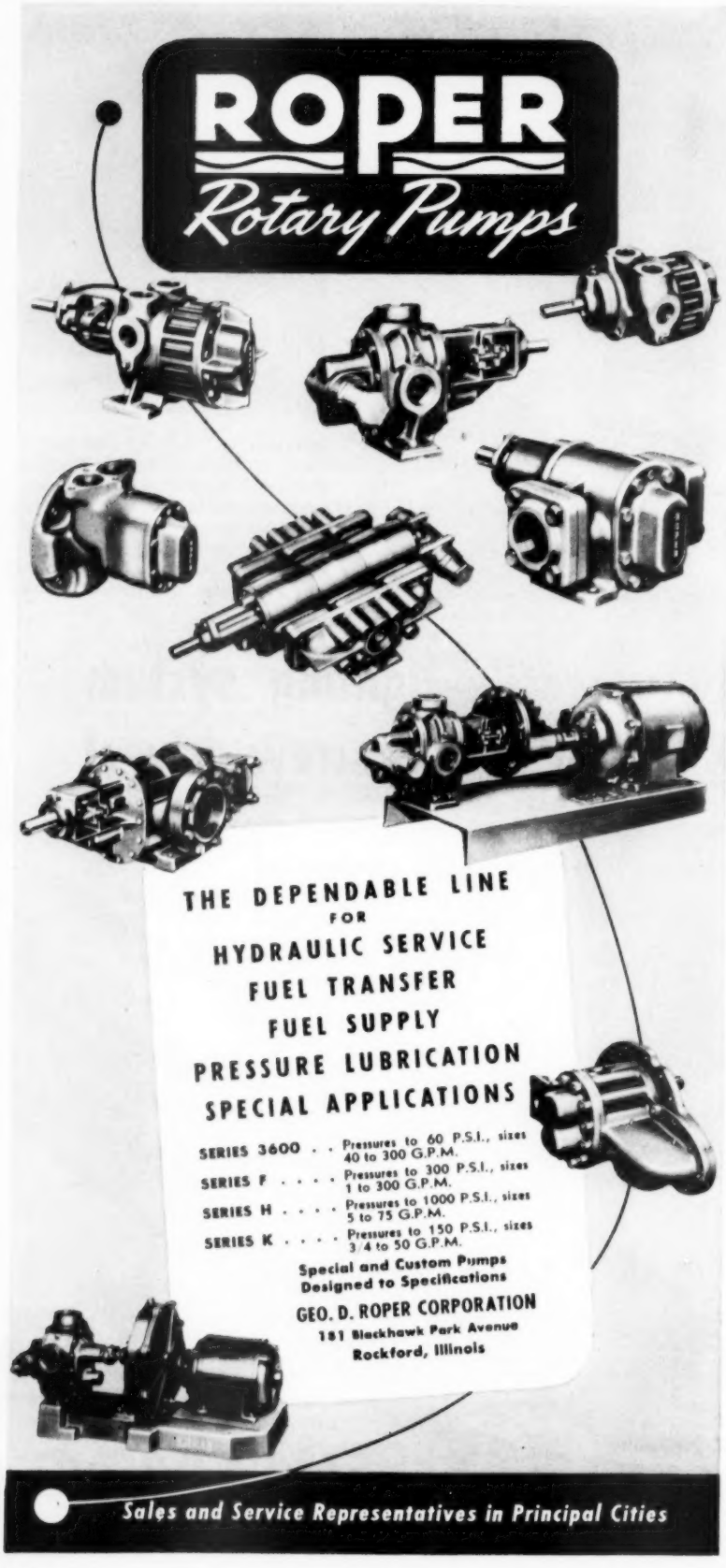
PIONEERS IN FLEXIBLE ELECTRICAL DISTRIBUTION SYSTEMS

BULLDOG

1902-1952 . . . SERVING INDUSTRY FOR 50 YEARS WITH FINER ELECTRICAL PRODUCTS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Special and Custom Pumps Designed to Specifications
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INDUSTRIAL FILMS NOW AVAILABLE

"ARTIFICIAL RESPIRATION" demonstrates the relatively new back-pressure - armlift resuscitation method (FACTORY, March 1952, p. 124). The black and white sound film runs 6 minutes. For sale, $37.50; for rent, $4. Write:
Association Films, 347 Madison Ave., New York.

"ATOMS AT WORK" gives you a glimpse of the peacetime side of atomic energy (FACTORY, April 1952, p. 116). You watch radioactive materials being produced, handled, and used. 10 minutes. For sale: $32.50; for rent: $1.50. Write:
British Information Service, 30 Rockefeller Plaza, New York 20.

SAFETY is the subject of a series of four sound slidefilms. They're designed for presentation in four discussion training sessions for plant employees. They show what goes to make efficient production, then point out how accidents are major production inefficiencies. Each runs 45 minutes. Write:
Human Relations for Industry, 443 Delaware Ave., Buffalo, N. Y.

"TAKE A LOOK AT TOMORROW" describes the present and examines the future of aluminum. It shows you the process of making aluminum, from mine to metal, demonstrates new applications. 24 minutes, sound, color. Write:
Kaiser Aluminum & Chemical Corp., 1924 Broadway, Oakland, Calif.

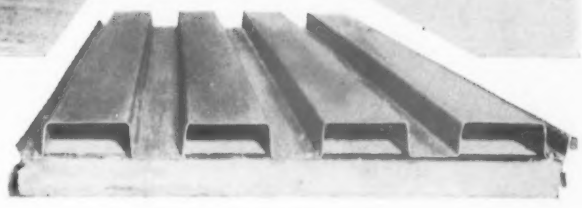
"QUIET PLEASE", a 20-min, sound-color film, outlines the general principles of acoustics and tells how you can apply them to control noise in all types of buildings. For free loan, write:
Acoustical Dept., Celotex Corp., 120 S. LaSalle St., Chicago.

Turn the page

Insulated panels of U·S·S 17 (Type 430) Stainless Steel mean fast, low-cost construction at Fairless Works

4005 sq. ft. of panels installed by crew of 4 in 8 working days

WORKING UNDER ADVERSE WEATHER CONDITIONS, a crew of four installed 4005 square feet of insulated Stainless Steel panels on this building in less than eight working days. The panels were manufactured by H. H. Robertson Co., Pittsburgh, Pa.; installed by R. A. Steelman Co., Trenton, N. J.; architects were Walter Kidde Constructors, Inc., New York.



CROSS SECTION of a complete panel for the fire station at United States Steel's Fairless Works shows the formed Stainless Steel exterior sheet, 1½" of insulation and the coated steel interior.

CONSTRUCTION with insulated building panels of U·S·S 17 (Type 430) Stainless Steel is gaining considerable momentum in the field of industrial building—such as power plants, factory office buildings, warehouses, etc. Architects and owners alike have been quick to recognize the advantages of light panel weight, long building life, minimum maintenance, low labor costs and fast erection in any type of weather.

The building shown here is a Stainless-paneled fire station at the new Fairless Works of United States Steel Corporation at Morrisville, Pa. The 66′ x 100′ structure contains 4005 square feet of insulated panels of 20 gage U·S·S 17 Stainless Steel.

A crew of four men erected the panels under adverse weather conditions in less than eight working days. The prefabricated sandwich panels, consisting of U·S·S 17 (Type 430) Stainless Steel exterior, 1½" of insulation and a coated steel sheet interior, were attached to the structural steel framework by spot welding, a fast and strong method of installation. U·S·S 17 (Type 430) is readily available without CMP tickets.

A new book containing the latest information on construction with panels of U·S·S 17 Stainless Steel is now being distributed. For your copy, use the coupon below.

United States Steel Corporation
525 William Penn Place, Room 2808-L
Pittsburgh 30, Pa.

Please send me your new booklet on U·S·S 17 Stainless Steel for industrial buildings.

Please arrange to have fabricators of Stainless Steel wall panels send me literature on their particular type of construction.

Name ..... Title .....

Address .....

City ..... State .....

United States Steel produces only the Stainless Steel sheet and strip from which panels of this type are made; the panels themselves are fabricated by a number of our customers.

UNITED STATES STEEL CORPORATION, PITTSBURGH · AMERICAN STEEL & WIRE DIVISION, CLEVELAND · COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
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U·S·S STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

8-200

UNITED STATES STEEL

Installed on the mezzanine floor at Courtaulds (Canada) Limited are 15 large compressors and vacuum pumps, all supported on special Korfund steel spring vibro-isolators. This view of a portion of the mezzanine shows the method of mounting this battery of I-R and York equipment.

...by controlling vibration

For best plant and machinery layout, and for lowest construction costs, Courtaulds and its engineers, Robert A. Rankin Co., wanted to construct a new building in a central location—*with this heavy equipment on a mezzanine floor.* Since this rayon plant is almost completely automatic in operation, however, they had to be absolutely certain that no transmitted vibration would upset delicate electronic controls.

Korfund engineers designed special spring-isolated bases for the pumps and compressors, and Courtaulds was able to place them on the mezzanine with no disturbance transmitted to other floors or to electronic controls.

Courtaulds saved the extra cost of piling for each foundation which would have been necessary for the usual basement installation, and obtained better plant layout. *In fact, Courtaulds reported that Korfund isolators more than paid for themselves in reduced construction costs alone.*

For less exacting installations, there are standard stock Korfund isolators. A selector chart in Bulletin G-104 gives recommendations for both normal and critical conditions, for pumps, compressors, centrifuges, machine tools, presses, hammers, and most other processing and mechanical equipment. See Sweet's Catalog Files, or write us for your free copy today.

We'll gladly submit recommendations without obligation. Just contact us, or the Korfund representative you'll find in most principal cities. A half century of experience is at your disposal.

KORFUND VIBRATION CONTROL

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FILM PROGRAM OF THE MONTH

Begins on page 316

PLANT MAINTENANCE

Starting a plant maintenance training program? Then you'll want to use films—one of the best and easiest-to-use teachers of all. Here's a list of some good general films on various phases of plant maintenance. They were selected especially for you by film evaluation experts at Washington State College's Audio-Visual Center.

"LUBRICATION AIN'T NO PROBLEM" is a humorous film on how the lubrication of machinery should not be done. It portrays a frustrated maintenance man going through his plant lubrication routine. Shows the effect of slip-shod maintenance procedures. The film is primarily intended to promote Westinghouse sealed-bearing lubrication. A good film for foremen and maintenance men. 9 minutes, sound. Available free from:

Westinghouse Electric Corp., Film Div., Box 869, 511 Wood St., Pittsburgh 30.

"HINTS ON ELECTRICAL SERVICING" shows various types of electric motors and the possibilities of trouble with each. Explains what can happen to cause electrical breakdowns, how to recognize and repair them. Shows easy tests and checks, and stresses common sense in finding the difficulty. An excellent training film that's both accurate and up to date. Good for electrical maintenance men. 20 minutes, sound, color. Available free from:

Westinghouse Electric Corp., Film Div., Box 869, 511 Wood St., Pittsburgh 30.

"THE CLEANING AND MAINTENANCE OF SOFT FLOORS" describes methods and techniques for the care of soft floors. Outlines and demonstrates the equipment used. Especially good for showing proper

CLARK TYPE "CY" SUPERIORITY AT ALL POINTS OF THE COMPASS

MAGNETIC ARC INTERRUPTORS WITH STEEL ARC SHELL
ONE PIECE UPPER ARC SHELL
FINGER CLIPS FOR EASY INSPECTION
NO SPRINGS ON VERTICAL LIFT MAGNET
DOUBLE BREAK SILVER CONTROL CIRCUIT CONTACTS
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MELTING ALLOY TYPE OVERLOAD RELAYS
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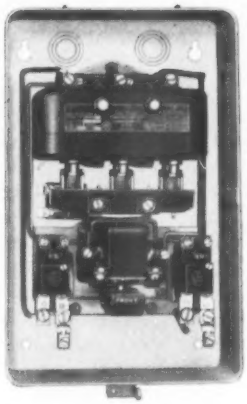
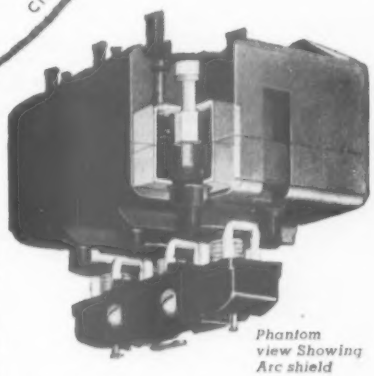


Size 2 Non-Reversing Type "CY" AC Motor Starter

Nationwide customer acceptance and satisfactory use of CLARK TYPE "CY" STARTERS in all types of industries is the best proof of their superiority.

The new arc quenching principle, in which the arc is constantly forced to rotate from a hot spot to a relatively cool spot, has proved its efficiency in thousands of installations.

The constant moving of the arc effectually prevents pitting of contacts — thus resulting in longer contact life.



Phantom view Showing Arc shield

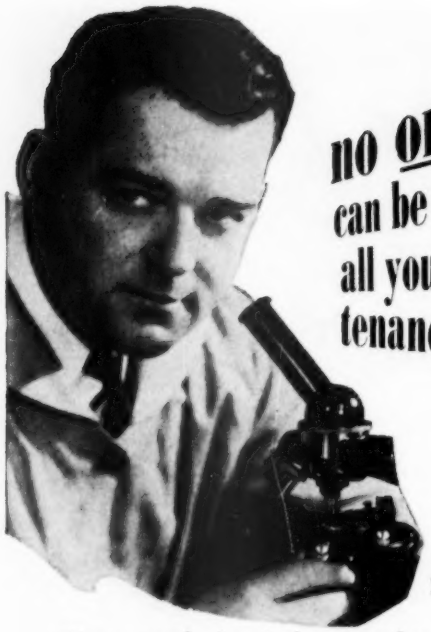
Available in standard across-the-line, with safety switch or circuit breaker, reversing, and multi-speed types, and in all standard NEMA air break type of cabinets. There's a Type "CY" starter to meet every possible operating application and condition.

You owe it to yourself, in avoiding down time, costly maintenance, and keeping up high production, to use CLARK TYPE "CY" STARTERS.

Why don't you try CLARK TYPE "CY"?

THE CLARK CONTROLLER CO.

ENGINEERED ELECTRICAL CONTROL • 1146 EAST 152ND STREET, CLEVELAND 10, OHIO



no one paint can be a cure-all for all your paint maintenance problems!

One medicine can't cure all ailments. One size shirt can't fit all men. And it's just as impossible for one paint product to answer all your paint maintenance needs.

The research chemist knows and so does the experienced maintenance engineer that the typical industrial plant presents many varied maintenance problems. In one instance the problem may be to find a protective finish which has maximum acid resistance. Moisture may be the chief concern in another quarter. Or perhaps it's mold and mildew prevention . . . or heat resistance . . . or the retarding of rust.

The best and easiest way for you to cut maintenance costs is to be sure you use special protective finishes made to cope with the particular problems you encounter in your plant. If you want the *best* in specific industrial paint products—and the best is always the cheapest in the long run — insist on VALDURA *Heavy Duty* Maintenance Paints. There's a *specific* VALDURA Heavy Duty Maintenance Paint for every recognized industrial need. If you've got a *special* problem VALDURA'S Technical Service Department is available to you without charge.

Check the convenient reply coupon and VALDURA will be *at your service* — immediately!

For further information just attach this coupon to your business letterhead and mail to VALDURA, 101 East Ontario Street, Chicago 11, Illinois.

☐ Please have your representative call.
☐ Please have a technical expert call to give advice on special problem.

Send information on—
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☐ _____ Indicate any other type of paint you are interested in.

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Heavy Duty Maintenance Paints

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FILM PROGRAM OF THE MONTH

Begins on page 316

care of asphalt tile, linoleum, and rubber floors. Discusses the planning of floor care and the scheduling of tiles and frequency of cleaning. Takes up sweeping, mopping, rinsing, and waxing. Of special interest to building maintenance workers and janitors. 23 minutes, sound, color. Available free from:

National Sanitary Building Assn., 139 North Clay St., Chicago 2.

"SERVICING CLARK FORK TRUCKS, PREVENTIVE MAINTENANCE", a 2-part film, covers the preventive maintenance of the Clark Utili-Truck. Although the films refer to one particular type of fork-lift truck they also apply to equipment of other manufacturers. Excellent training films for mechanics. Part I uses a maintenance chart for a guide in the step-by-step presentation of the greasing operation. Calls attention to key points, shows trouble-shooting techniques for engine maintenance. Concludes with general suggestions on how to keep the equipment at top efficiency. Part II deals with major repairs and is equally good. 20 minutes, sound. Available free from:

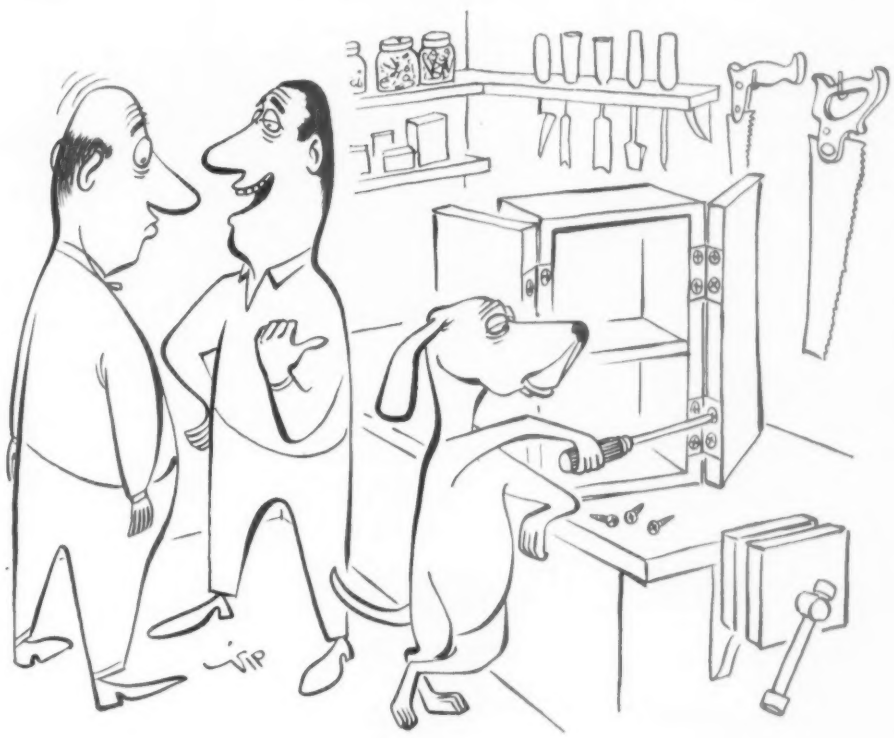
Dept. of the Air Force, Hqs. U. S. Air Force, Washington 25.

"RATPROOFING OF EXISTING BUILDINGS" is a sound slidefilm on ratproofing doors, windows, ventilators, vent stacks, and chimneys of existing buildings. Shows before and after views of pipes, foundations, elevator pits, and walls. Explains how costs are estimated. Describes the proper planning and execution that should go into ratproofing of older buildings. 10 minutes, sound. Available free from:

U. S. Public Health Service. Washington 25.

What's Screwy?

by Phillips



"Oh, he's not so smart. It's just that those Phillips Screws are so easy to drive."

PERFECTLY MATED! Only Phillips Drivers are perfectly mated to Phillips Screws. Look for the name Phillips on the shank.

EASE of driving is only *one* big advantage. Phillips Screws save time, work and money. They also add structural strength, set up tighter, resist the loosening effect of vibration. And they eliminate driver skids, damaged parts and split screw heads.

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X marks the spot... the mark of extra quality

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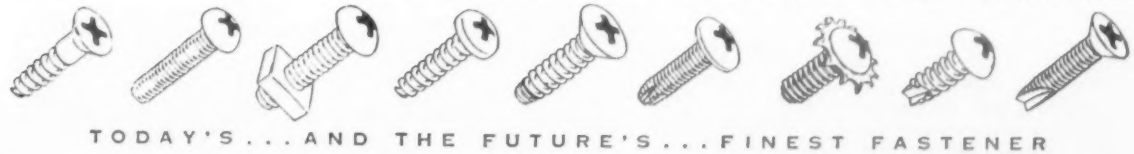

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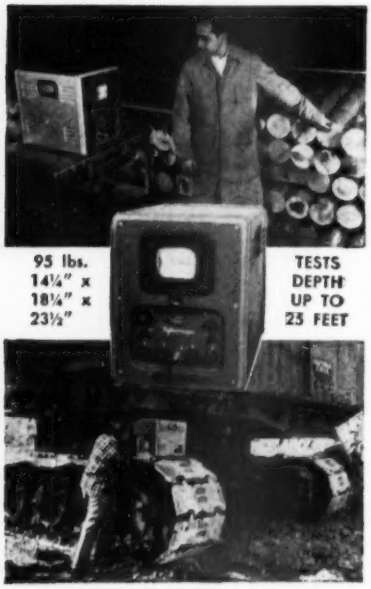

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BEHIND THE BYLINE

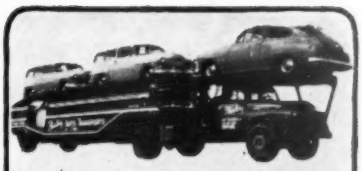
Meet some of the men in industry who wrote articles for this issue of FACTORY.

DR. JACK W. DUNLAP, who writes about biomechanics (page 96), is president of Dunlap & Associates, Inc. He's directed management studies for industry and research studies for the Department of Defense. He's also authored several texts on statistics.

WILLIAM B. WORTHINGTON learned in Arabia that the best way to get his ideas across to others was with photos (page 84). During 1951 he served as a consultant to an oil company there. Back in the U. S. now, he's a consulting management engineer.

HAROLD L. HUMES is the man behind the mechanized bulk handling at Baldwin-Hill Co. He's vice president in charge of manufacturing, research, and development, with many years in metallurgy and management. See page 90.

Turn the page



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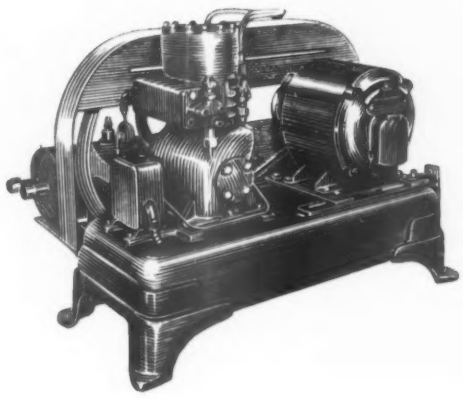
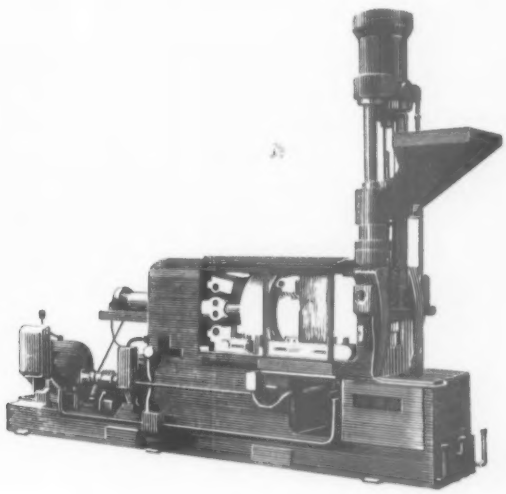
REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.





THIS 2-H. P. REFRIGERATION MACHINE AND THIS PLASTIC MOLDING MACHINE

Speed Production... Reduce Rejects... Save Down-Time

CAN MODERN REFRIGERATION HELP YOU, TOO?

Throughout American industry mechanical air conditioning and refrigeration have become invaluable tools of production. In fact, many industries couldn't exist without these modern facilities.

For example . . . in the rapidly expanding field of plastics, refrigeration serves many practical purposes. Chilled water cools high-speed injection molding machines, such as that shown above. The cooled molds produce better plastic moldings. In some plants, output is often stepped up at least 5%. Defects are fewer. Scrap is reduced as much as 15%.

Refrigeration also cools hydraulic oil used in operating injection plungers of the machines. Control of oil temperatures, even at high-speed operation, frequently results in reducing down-time 15% or more.

These are typical of the saving that results when refrigeration is applied to industrial production problems. Discuss the subject with your own plant engineers. They may suggest applications of refrigeration and/or air conditioning that could cut costs . . . boost output . . . improve your product . . . increase profits.

And in considering equipment for refrigeration and air conditioning systems . . . bear in mind that most modern installations are operated with "Freon" refrigerants. These refrigerants are safe . . . nonflammable, nonexplosive, virtually nontoxic, and they insure dependable, economical performance of the system over a long period of time. A book, "How Air Conditioning and Refrigeration Benefit Industry", will be sent on request. E. I. du Pont de Nemours & Co. (Inc.), "Kinetic" Chemicals Division, Wilmington 98, Delaware.

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YOU CAN BE SURE...IF IT'S Westinghouse

J-02255

BEHIND THE BYLINE

Begins on page 322

RICHARD DE PASTINA joined Westinghouse in 1943 as a lab technician. Today he's an engineer at the company's headquarters manufacturing engineering labs. He has helped develop slid-abrading, is considered a company expert (page 106).

D. C. PETERSON rounds out 38 years in engineering, manufacturing, and plant management. He's with Stewart-Warner Corp. as director of engineering and manufacturing, Division 1. Writes about overlapping conveyors, page 100.

NORRIS E. COALWELL started his career with Dow Chemical Co. in 1925 as an employee in the pipe shop, worked his way up until, in 1941, he became general plant superintendent in charge of maintenance and service. The salvage department is his baby (page 142).

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A Ranney Water Collector is far less expensive to operate —uses fewer pumps, fewer personnel, less power, and usually requires no treatment facilities.

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A single Ranney Water Collector has produced more clear, cool water than ten conventional vertical wells.

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Boise Water Corporation, Boise, Idaho
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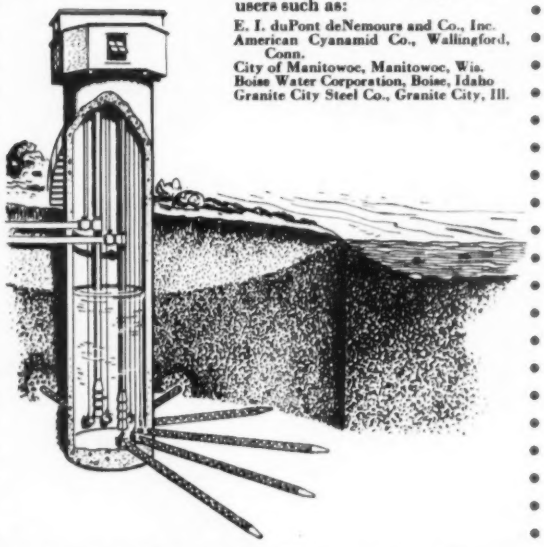

An inexpensive Ranney survey will determine how the Ranney Method can work for you.

If you need water, write us for complete information on how a Ranney Water Collector will solve your problem.

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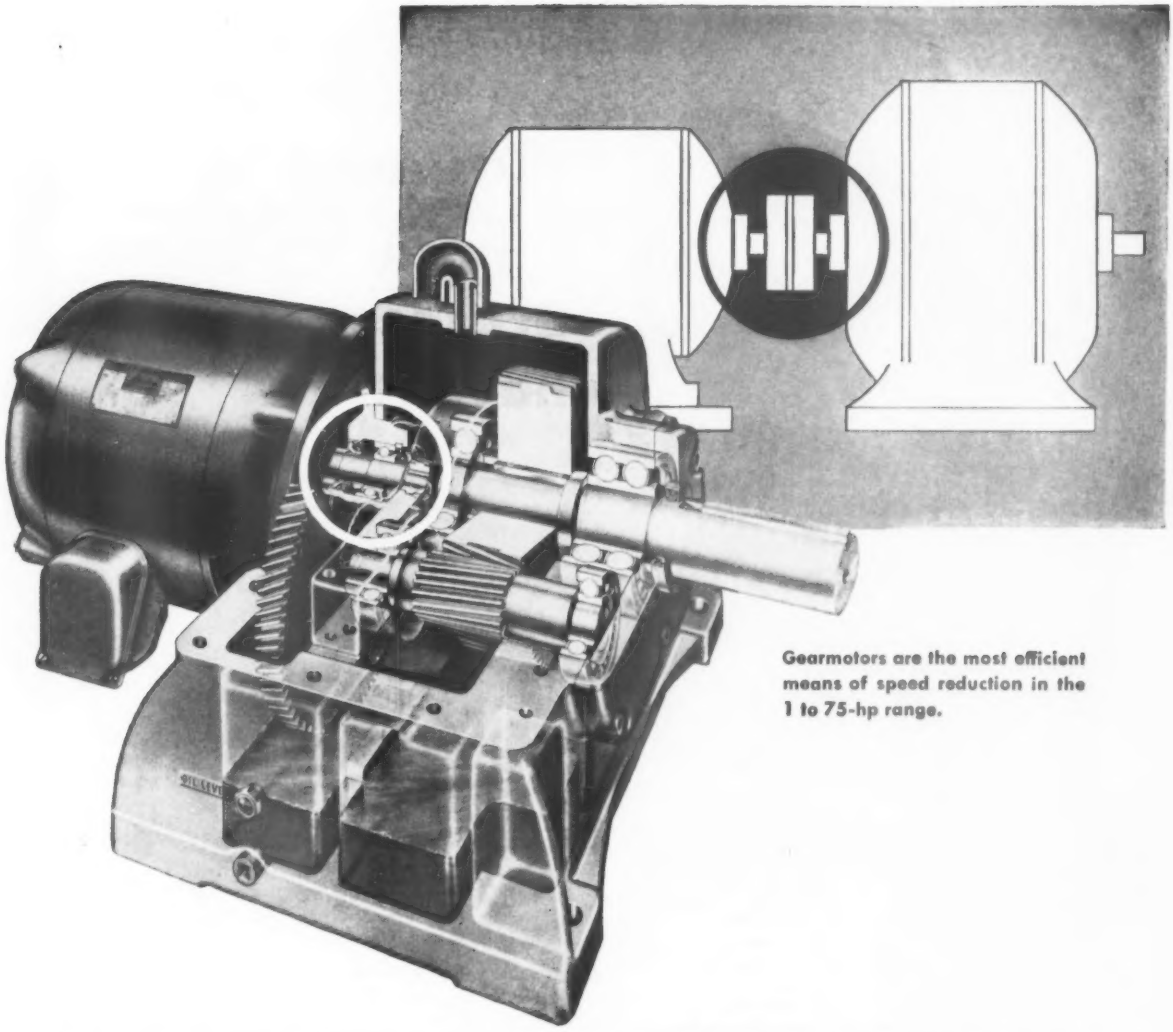

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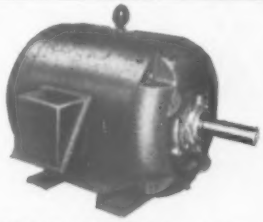
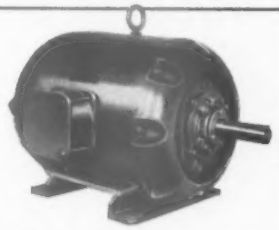


TYPE CP—Totally-enclosed Fan-cooled. Steel frame. 1 to 250 hp.



TYPE HP—Explosion-proof. Steel frame. 1 to 250 hp.

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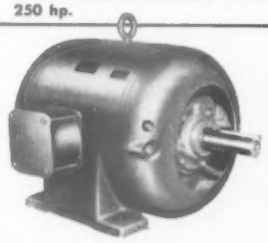

TYPE JP—Explosion-proof. Cast iron frame. 2 to 250 hp.

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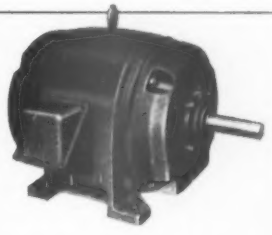
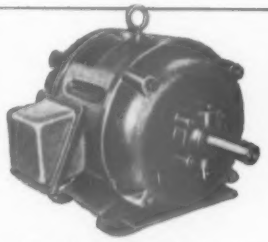
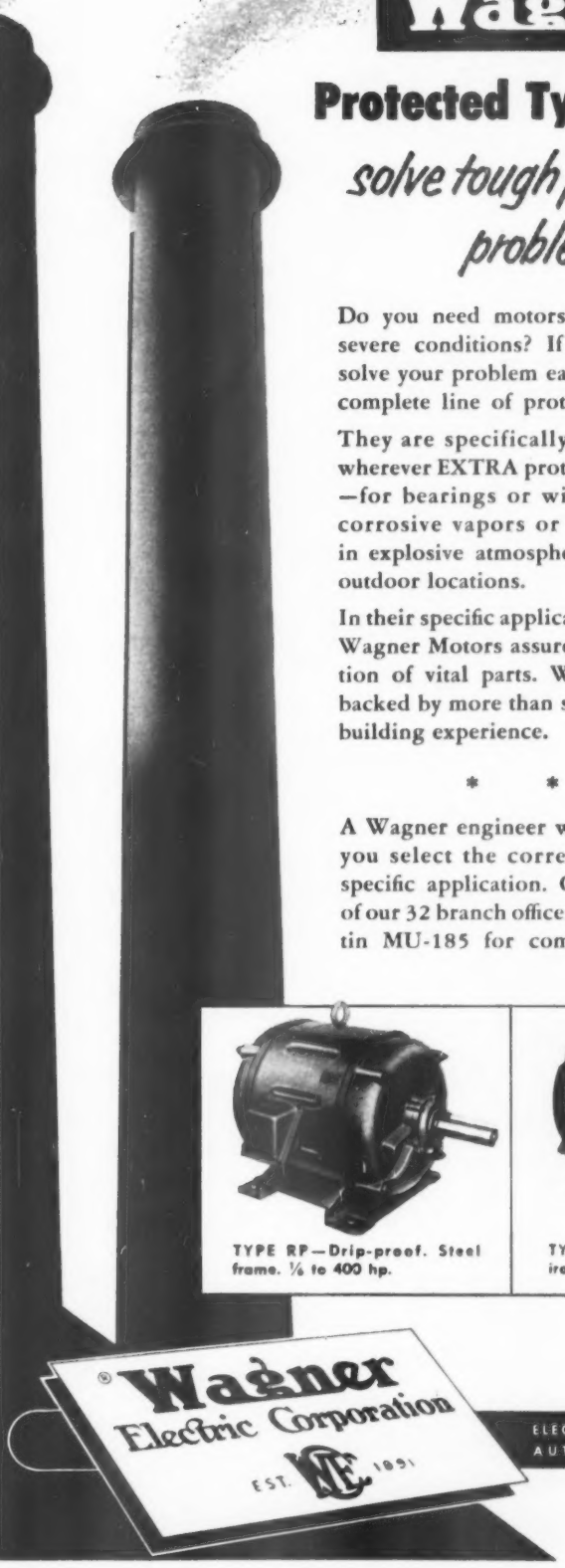


TYPE XP—Splash-proof. Cast iron frame. ¾ to 200 hp.



TYPE TP—Totally-enclosed, non-ventilated. ¼ to 15 hp.



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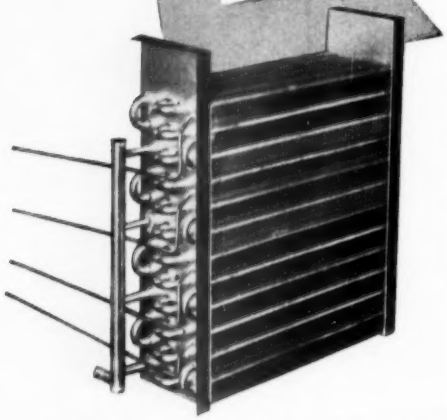
BRANCHES IN 32 PRINCIPAL CITIES

MS3-10

"Special Coils for special heating or cooling problems"



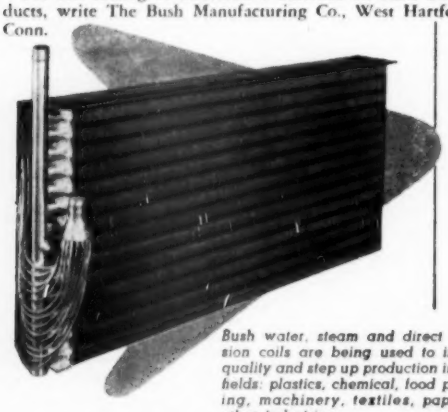
If you have a problem involving heating, cooling or dehumidification, join the many Plant Engineers who have used Bush coils to improve quality and increase production of their products.

Heat transfer equipment is specialized equipment. This is particularly true of finned coils. In their construction, careful consideration must be given to circuiting, tube size, fin size, header construction, ratio of prime to secondary surface, etc.

The Bush Manufacturing Co. has specialized in finned coil construction since the air conditioning industry was in its infancy.

Why not discuss your heat transfer problem with a capable Bush Sales Engineer? He'll be glad to recommend coils designed to meet your special operating or space requirements.

For coil catalog or informative bulletins on other Bush products, write The Bush Manufacturing Co., West Hartford 10, Conn.



Bush water, steam and direct expansion coils are being used to improve quality and step up production in many fields: plastics, chemical, food processing, machinery, textiles, paper and other industries.

Bush Manufacturing Company

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How a carbide die outperforms a steel die by 25 to 1 for Schick, Inc.

In past six years, a Carboloy die (shown at left) produced over 62,500,000 parts with only 25 regrinds. It saved 4,375 hours of steel-die regrinding time . . . saved 900 hours of press setup time because of longer production runs. Carbide die produces over 2,500,000 pieces per grind . . . steel die, less than 100,000.

Carboloy Cemented Carbide die built for Schick, Inc., in 1946 by Lincoln Park Industries under direction of Mr. George F. Eglinton. Die is still in daily use.

You get more carbide benefits with Carboloy dies and services!

For blanking, forming, drawing and piercing dies that will stand up under terrific hour-after-hour pounding . . . always specify Carboloy Cemented Carbide.

It's quality-controlled by 29 rigid, probing tests that stem from Carboloy experience as world's largest maker of cemented carbides.

You get extra die life from Carboloy Cemented Carbide — hardest metal made by man — because extra life is built into it!

Carbide benefits

You or your die maker may order Carboloy Cemented Carbide made to your specifications in rough-finished form. You get all carbide benefits . . . and final finishing and assembly into your dies are easily done in your own toolroom, or by your die maker.

Carbide specialists

Carboloy Field Engineers are ready with on-your-job solutions to tough die problems . . . and ready to help you design new carbide applications.

Carbide training

Your key toolroom personnel can learn latest carbide techniques, become expert in finishing and servicing carbide dies at the Carboloy Customer Training School.

Carbide data

For a handy, all-inclusive guide showing how easy it is to design, use and maintain carbide dies, write for the Carboloy Die Engineering Manual, D-124.

To get the complete story of how Carboloy dies and engineering services offer more carbide benefits . . . greater production with less downtime and maintenance . . . fewer rejects and less refinishing . . . call in your local Carboloy representative or write today.

"Carboloy" is the registered trademark for the products of Carboloy Department of General Electric Company.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
11135 East 8 Mile Blvd., Detroit 32, Michigan

Plants at Detroit, Michigan; Edmore, Michigan; and Schenectady, New York

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The use of Carboloy Cemented Carbides in press dies is just one of the countless ways Carboloy created-metals are used in industry. Write us today. A Carboloy field engineer will show you, in your plant, how carbides and other Carboloy created-metals, listed below, can help you increase production, improve your products. And look to Carboloy metallurgists for future created-metals for even broader fields of use.

CARBOLOY CREATED-METALS

ALNICO PERMANENT MAGNETS for lasting magnetic energy
CEMENTED CARBIDES for phenomenal cutting, forming, wear resistance; including
CHROME CARBIDES for exceptional resistance to abrasion—erosion—corrosion
HEVIMET for maximum weight in minimum space, and for radioactive screening

FIRST IN MAN-MADE METALS FOR BETTER PRODUCTS

A "Sweet" Cleaning Job by TORNADO®

See us
Plant Maint. Show
Booth 1650

Peerless Confection Co., Chicago, uses Tornado for cleaning throughout candy plant

Wet pickup after scrubbing

Overhead cleaning of heat pipes

A manufacturer of confections must keep a plant immaculate to maintain rigid sanitary standards.

To do this job, the Peerless Confection Company uses Tornado for cleaning from floor to ceiling. 1. They follow floor scrubbing operations with Tornado to pick up solutions and leave floors clean and dry. 2. Ceiling fixtures and overhead pipes are kept free of dust with Tornado. 3. Even stored products are cleaned of all dust with Tornado.

No matter what business you are in, cleanliness and proper maintenance is an important factor in production, safety and profits. Let us tell you about the unusual Tornado method of cleaning. **Just write for Bulletin 607.**

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How much do you weigh?

Booth 232
Maintenance
Show
Cleve., O.
Jan. 19

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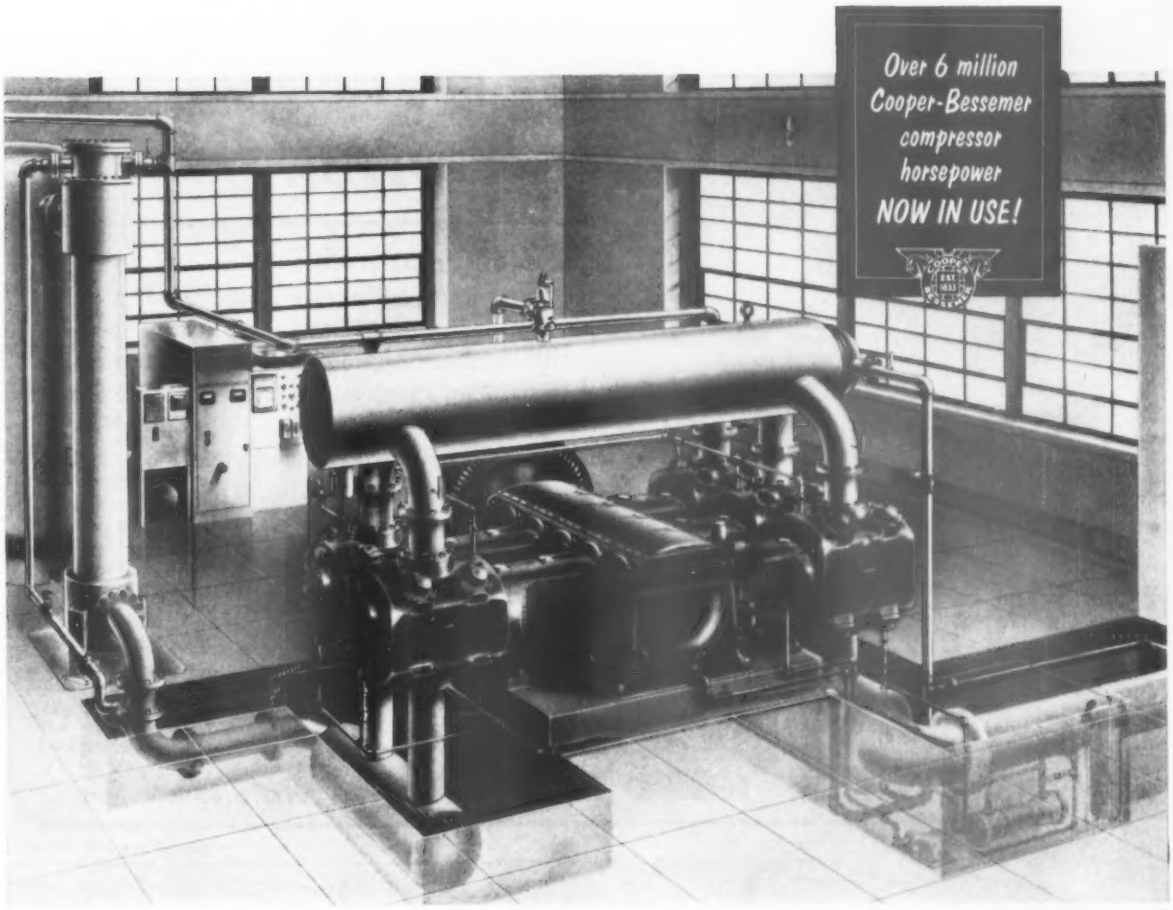

Recommended setup
FOR SHOP AIR AT LOWEST COST!

THE above illustration shows a modern air compressor installation completely equipped with controls capable of functioning efficiently under all plant air requirements.

This opposed-action unit is one of the latest Cooper-Bessemer motor-driven compressor designs and is rated 1,000 hp, delivering 5,000 CFM at 100 lbs. operating pressure. The Cooper-Bessemer opposed-action design contributes to space-saving compactness, vibration-free operation and long life. Note also that in this setup pulsation dampers are located on all suction and discharge lines, and that all controls are localized on a single panel for maximum compactness and convenience. Finally, space requirements, piping and line losses are minimized with a single overhead intercooler.

Whatever your requirements for air, Cooper-Bessemer engineers will be glad to work with you and help you come up with *more air . . . in less space . . . at lowest cost.*

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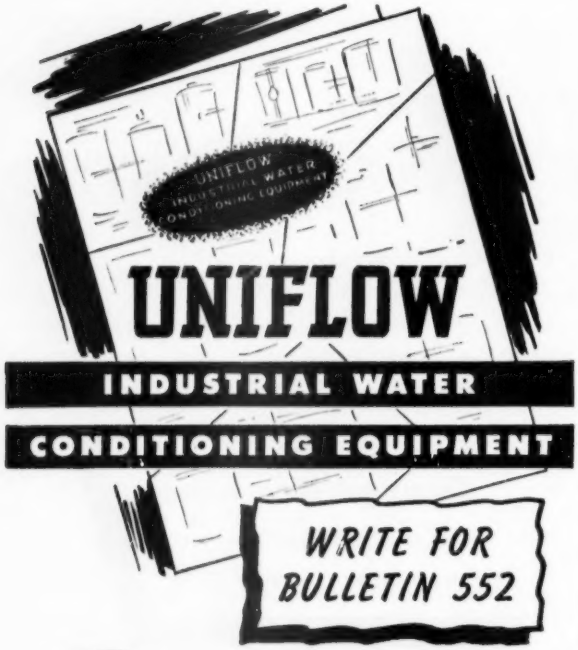
HOOD gloves keep working hands safer

HOOD RUBBER CO., Watertown, Mass.



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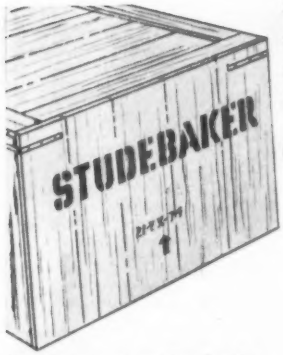
TOOLING ENGINEER

Nationally known firm is seeking Chief Tool Engineer for Southern California plant. Qualifications: Broad experience in tooling and high production machine shop methods including extensive tool design and shop experience; good knowledge of cutting tool selection and use, particularly with cast iron, and familiarity with heat treating and plating. Pressed metal tooling experience also desirable. This is a permanent position with excellent future.

Please give a complete resume of education, experience and background in first reply.

P-6006, FACTORY MANAGEMENT & MAINTENANCE
1111 Wilshire Blvd., Los Angeles 17, Calif.



RUBBER-TIRE LORAIN loads 24 crated cars and trucks daily for export shipment

Put these cost-cutting Lorain Self-Propelled Crane features to work in YOUR plant . . .

- One-man operation—work any hour, any season, with equal efficiency.
- More than 16 lifting attachments available for any size, shape or type material.
- Unlimited rubber-tire mobility — move anywhere, any place around your yard — move materials when and where you need them.
- Fewer aisles — more storage space — stack materials higher — reach farther with the long crane boom.
- Fingertip air steering — air brakes — all controls in operator's cab — 4 speeds in both directions, 1 to 7 m.p.h.

Handling big, bulky boxes for export shipment is no problem at the South Bend, Indiana, Studebaker Plant. Using a mobile Lorain Self-Propelled Crane, Model SP-254, Studebaker keeps a steady flow of crated assemblies, weighing an average of 3-1/2 tons, heading for export destinations every day. 12 crated cars and 12 crated trucks daily are loaded by this fast stepping, versatile Lorain crane. Notice how the Lorain has been fitted with a special 30 ft. gooseneck boom to give clearance to the extra-long boxes, measuring as much as 26-1/2 ft. in length and weighing up to 10,000 lbs. Also, note the special clamp that firmly grips the box for loading. These are but a few of the many ways Lorain cranes can be adapted to *your* material handling.

This is the third time Studebaker has chosen rubber-tire Lorains for their plant. Here's proof of satisfaction . . . not only with Lorain performance, but in the advantages of Lorain rubber-tire mobility on material handling jobs.

To get things on the move, faster, more economically . . . to handle your materials like the biggest, most progressive companies do, investigate the complete line of Lorain cranes. Your local Thew-Lorain distributor can give you the facts.

THE THEW SHOVEL CO.
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Lorain specializes in mobile crane power for material handling . . . offers crawler and rubber-tire mountings up to 45 ton lifting capacity. There is a size to fit your material handling needs . . . and a right attachment for any kind of material.

THEW LORAIN®

metallizing
cuts tank maintenance ...extends life

This 20-year old tank, used by a St. Louis brewery for boiler feed water supply, had become so badly scaled that it seemed ready for the scrap heap. Instead it was metallized with a .008" coating of pure aluminum, after being cleaned by grit blasting. Job was done by the St. Louis Metallizing Co. between 6 P.M. one Friday night and 6 P.M. the following Sunday, during a plant shut-down. This tank is now good for another 15 years, at least.

Boiler feed water tank shown encrusted with rust and mineral deposits before metallizing.

Feed water tank being metallized after preparation by grit blasting.

The Metco* Systems Maintenance-free life of pure zinc and aluminum coatings is frequently in the 20 to 25 year range. And now, with the Metco Systems, the problems of coating standardization are eliminated. These Systems are a series of 18 basic engineering specifications developed over 19 years' of experience with such coatings on many different types of structures and equipment. The Metco Systems provide the answer to standardization of surface preparation, metal coating thicknesses and organic after-coatings for various service conditions and appearance requirements.

*Reg. U. S. Pat. Off.

See other examples of metallizing for corrosion protection illustrated in our 8 page Bulletin in your Sweet's Plant Engineering File—Section 7a/Me.

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☐ Please have Metco Field Engineer call.

☐ Please send me, without obligation, Bulletin No. 62B—*Corrosion Prevention with Metallized Zinc or Aluminum.*

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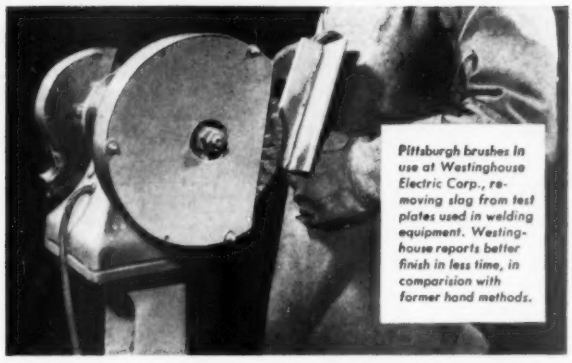
CITY_____ ZONE_____ STATE_____



Pittsburgh brushes in use at Westinghouse Electric Corp., removing slag from test plates used in welding equipment. Westinghouse reports better finish in less time, in comparision with former hand methods.

Replace hand finishing with power-driven Pittsburgh Brushes for

Better Cleaning Lower Labor Costs Fewer Rejects

—as these companies did:

Removal of imbedded slag in welding test plates formerly was done by hand at the Westinghouse Electric Corp., Trafford, Pa., using a wire brush and welder's hammer. Pittsburgh brushes, powered by a direct-drive ½ h.p. motor, now remove more slag in less time, and produce a better finish. In addition, Westinghouse reports their Pittsburgh brushes "stand up better than average in use."

Complete cleaning of dried concrete, rust and scale from steel frames used in concrete forming is essential prior to re-using the forms. Pittsburgh wire brushes were installed at the Universal Form Clamp Co., Chicago. Working on a conveyor-fed machine, the Pittsburgh brushes now remove all foreign material at a rate of 50 pieces per hour, replacing former laborious hand brushing and scraping.

De-scaling preheated bar stock at the Dominion Forge & Stamping Co., Ltd., Canada, was formerly done by hand scraping. This never did a complete job, and inclusions resulted which produced defective forgings. Pittsburgh brushes, on specially-designed machines, now do the job, and have "increased efficiency, decreased the amount of scrap, improved work quality, and saved labor."

WRITE TODAY FOR FREE BOOKLET!
Write today for a free copy of our booklet that shows, through actual case histories, how Pittsburgh cuts brushing costs. Address: PITTSBURGH PLATE GLASS COMPANY, *Brush Div.*, Dept. W-3, 3221 Frederick Avenue, Baltimore 29, Maryland.

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Revlon's Treasurer and General Manager, Joseph Revson, with "Fire and Ice" girl Dorian Leigh

He kept 7,235 dates with this girl!

Five months ago she was just an idea. Today, as the temptress who sells Revlon's new "Fire and Ice" Lipstick and Nail Enamel, she's America's most talked-about glamour girl!

"She created the greatest shipping problem we ever had," says Joseph Revson. "7,235 stores wanted 'Fire and Ice' merchandise and displays – to be delivered *before* the promotion date of November 1.

"There was only one way to keep all those dates! And as heavy re-orders flooded in, we continued to fill them via Air Express. Volume is now the heaviest in our history! In maintaining that momentum—and keeping the good-will of the stores—Air Express service has been invaluable.

"We don't overlook costs, either. Air Express rates are the lowest in the field on practically every shipment we make. With a volume like ours, those savings add up to a very substantial figure!"

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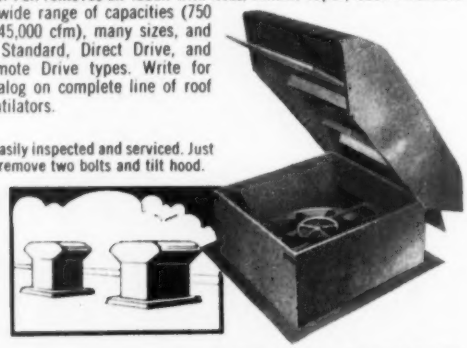

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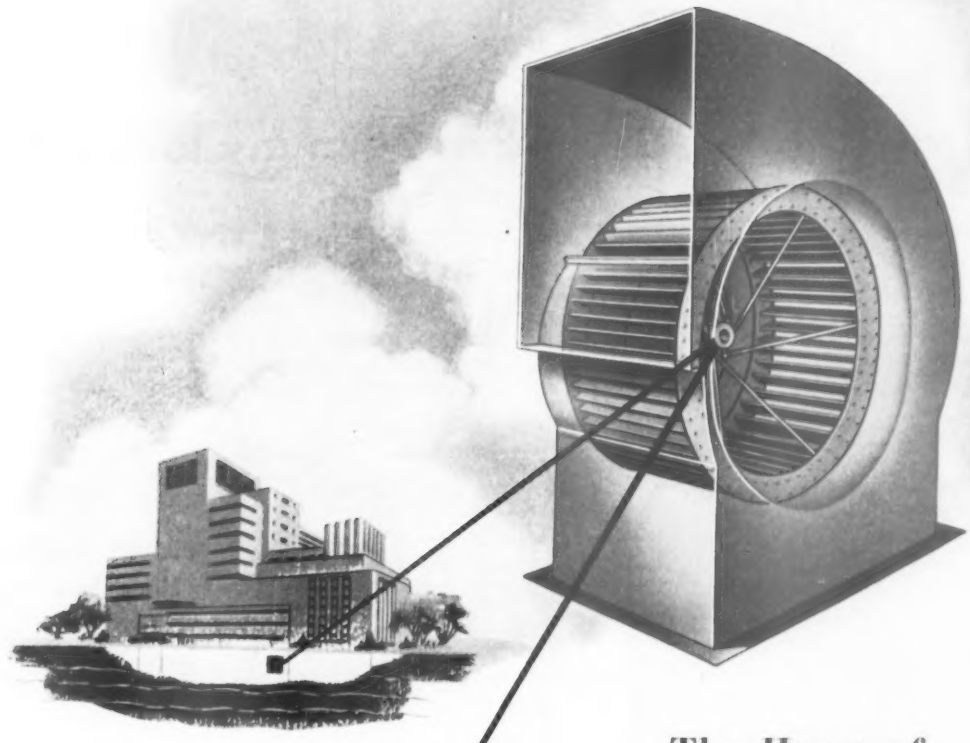


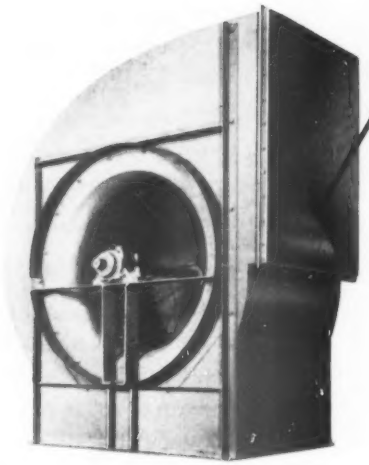
The Heart of Air Conditioning

So quiet it's hardly noticed, so compact it conserves valuable space, so efficient it's actually the heart of this hospital's vital air conditioning system.

> American Blower Sirocco Fans occupy less space and deliver more air per revolution than any other type fan. Slower speed means quieter operation, decreased wear, minimum maintenance.

Many thousands of Sirocco Fans have been installed throughout the world since 1908. Over the years many refinements have been included. New methods of construction have been perfected. But these fans still retain the proved Sirocco principle of delivering more air per revolution.

For data on how the Sirocco Fan can be used in your business, call the nearest American Blower Branch Office.



American Blower Series 81 Sirocco Fan. All Sirocco Fan ratings are certified in accordance with the Standard Test Code.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary corporation

AMERICAN BLOWER

YOUR BEST BUY IN AIR HANDLING EQUIPMENT

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS HEATER

"she might have been my kid..."

"There was no time to stop, see? She comes running out from behind this parked car right under my wheels. Her hair is in pigtails, and with the sun shining on it, she might have been *my* kid. We got her to the hospital. It took 3 pints of blood to bring her around. All I have to do is remember the sound of those screaming tires—and I know why *I'm* giving blood."

Yes, all kinds of people give blood—truck drivers, office workers, salesmen. And—for all kinds of reasons. But whatever *your* reason, this you can be sure of: Whether your blood goes to a local hospital, a combat area or for Civil Defense needs—this priceless, painless gift will some day save an American life!

Business Executives!
✓Check These Questions!

If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

- ☐ Have you given your employees time off to make blood donations?
- ☐ Has your company given any recognition to donors?
- ☐ Do you have a Blood Donor Honor Roll in your company?
- ☐ Have you arranged to have a Bloodmobile make regular visits?
- ☐ Has your management endorsed the local Blood Donor Program?
- ☐ Have you informed your employees of your company's plan of co-operation?
- ☐ Was this information given through Plant Bulletin or House Magazine?
- ☐ Have you conducted a Donor Pledge Campaign in your company?
- ☐ Have you set up a list of volunteers so that efficient plans can be made for scheduling donors?

Remember, as long as a *single* pint of blood may mean the difference between life and death for *any* American . . . the need for blood is *urgent!*

Give Blood Now

CALL YOUR RED CROSS TODAY!

NATIONAL BLOOD PROGRAM

HOW 35¢ CAN HELP YOU DO A BETTER JOB

Wouldn't you like to have—right in your own file—copies of complete, authentic articles on important Plant Operating subjects? You *can*. That's why FACTORY prints its famous Plant Operation Libraries.

They are 12- to 36-page articles reprinted from FACTORY's own pages. Many have been widely used by some of the largest manufacturing plants in the country.

And the price is low—only 35¢ each, except as noted in the list below. Pick the subjects you're interested in and order as many as you need. You can use the handy coupon.

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113. Principles of Maintenance Control
129. Keep Your Plant Up—Keep Your Costs Down
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140. How to Boost the Maintenance Department's Productivity—*50¢*

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15. Plant Layout
125. Adopt the Best in Plant Layout—*50¢*

Plant Services

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99. Lubrication
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134. Better Materials Handling for Cutting Costs and Increasing Productivity

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Editor, FACTORY 1-53
330 West 42nd St., New York 36, N. Y.

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*Except as noted above

How to keep informed on the "with what" part of your business

AT YOUR FINGER TIPS, issue after issue, is one of your richest veins of job information – advertising. You might call it the "with what" type – which dovetails the "how" of the editorial pages. Easy to read, talking your language, geared specifically to the betterment of your business, this is the kind of practical data which may well help you do a job quicker, better – save your company money.

Each advertiser is obviously doing his level best to give you helpful information. By showing, through the advertising pages, how his product or service can benefit *you* and *your* company, he is taking *his* most efficient way toward a sale.

Add up all the advertisers and you've got a gold mine of current, on-the-job information. Yours for the reading are a wealth of data and facts on the very latest in products, services, tools . . . product developments, materials, processes, methods.

You, too, have a big stake in the advertising pages. Read them regularly, carefully to keep job-informed on the "with what" part of your business.

McGRAW-HILL FOR BUSINESS

McGRAW-HILL PUBLICATIONS

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:
$1.50 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.
POSITION WANTED & INDIVIDUAL SELLING OPPORTUNITY undisplayed advertising rate is one-half of the above rate, payable in advance.
PROPOSALS, $1.50 a line an insertion.

INFORMATION:
BOX NUMBERS care of publication count as 1 line additional.
DISCOUNT if 10% if full payment is made in advance of four consecutive insertions of undisplayed ads (not including proposals.)
EQUIPMENT WANTED FOR SALE Advertisements acceptable only in Displayed Style.

DISPLAYED RATE:
The advertising rate is $18.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches —to a page. F.M.M.

NEW ADVERTISEMENTS—Address N. Y. Office, 330 W. 42 St., N. Y. 36, for February issue closing January 15th.

FOREMAN

ELECTRICAL, mechanical or industrial engineering background. Supervisory experience desired but not required.

THE company now in its 51st year is expanding rapidly. Net sales this year exceed 1938 by 16 times. Additional high caliber men are needed with training and experience in all phases of electronics, physics and mechanics.

Write us about yourself, if your experience and future plans fit into this picture.

JOHN WELD
Department D

SYLVANIA ELECTRIC PRODUCTS INC.
Radio and Television Division
254 Rano Street
Buffalo 7, New York

WANTED
FACTORY SUPERINTENDENT

Excellent opportunity for man who has successfully managed from 100 to 300 in production work. Salary and bonus based on company net profits should bring income of $10,000 to $15,000 a year. We have no union and no labor trouble. Key men in present organization will benefit from success of new superintendent, so complete cooperation is assured. We are manufacturers of sheet metal agricultural products. Previous experience in sheet metal fabrication not an essential requirement. Located 250 miles from Minneapolis, in growing city of 55,000. Write stating your age, experience, who you have worked for, length of time with each employer and reason for leaving, number of employees and any other information.

P-6300, FACTORY MANAGEMENT & MAINTENANCE
520 N. Michigan Ave., Chicago 11, Ill.

REPLIES (Box No.):
Address to office nearest you
NEW YORK: 330 W. 42 St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

SUPERINTENDENT. CAN plant located in Middle West requires an experienced man, 35 to 45 years old, capable of managing a plant employing 150 people. Applicant should have experience in general can manufacturing, light metal fabrication, metal lithography and tool and die construction. Write P-6218, Factory Management & Maintenance.

TRAINING DIRECTOR: Must have had broad scale experience as director of training both plant and executive level, willing to transfer to retail field, company with 4000 employees, age 35-50. Send complete history, references first letter. $10,000 to $12,000. Our fee paid by management. Western Employment, L. S. Mosson, Mgr., Sharp Bldg., Kansas City 6, Missouri.

EMPLOYMENT SERVICE

SALARIED PERSONNEL $3,000-$35,000. This confidential service, established 1927 is geared to needs of high grade men who seek a change of connection under conditions assuring if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. D, 241 Orange St., New Haven, Conn.

POSITIONS WANTED

PLANT MANAGER: University trained executive, age 37, experienced Production Control, Industrial Engineering, Plant Management in electro-mechanical industries. Desire position Plant Manager or Works Manager small or medium sized company, West Coast location. Teaching and Technical writing experience. Present location, Los Angeles. PW-6293, Factory Management & Maintenance.

RECREATION DIRECTOR, 37 years old, M.S.W. Degree in Group Work and Industrial Recreation, three years experience as Director of Employee activities programs, nine years experience with international recreation organization, desires to relocate, available July, 1953. PW-6145, Factory Management & Maintenance.

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AGGRESSIVE, FINANCIALLY responsible salesman seeks one or more accounts NY—NJ Area. Sell Fluid handling, control, alloy devices, etc. B.Ch.E. 1939. No obligation. SA-5458, Factory Management & Maintenance.

EXPERIENCED INDUSTRIAL Salesman available. Age 47, Married, 3 children, Engineering degree, many night schools including Dale Carnegie Institute of Human Relations and Babson Institute of Business Administration. Studied dozens of books on salesmanship. 10 years engineering experience, 13 years Industrial Selling. Available in 60 days. SA-6230, Factory Management & Maintenance.

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Time Study Equipment
Boards with U.C.E.Z. transparent watch holders, Stop watches, Pedometers, Slide Rules, Time study forms in stock. Sample kit free. Oznam Products Co., 5544 So. Homan Ave., Chicago 29.

INDUSTRIAL RELATIONS MAN
Progressive successful manufacturing plant, subsidiary corporation of large nation-wide firm; needs Assistant Industrial Relations Manager. 2000 employees. Location, South. Give full details, including salary, in first letter.
P-6343, Factory Management & Maintenance
520 N. Michigan Ave., Chicago 11, Ill.

SALARIED POSITIONS $3,500 — $35,000
We offer the original personal employment service (established 43 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars.
R. W. BIXBY, Inc. 276 Dun Bldg., Buffalo 2, N.Y.

EXECUTIVES AND TECHNICAL MEN
Desiring Positions with Stability
We solicit inquiries from qualified candidates who desire to contact employers for positions paying $5000 to $25,000 per year. Confidential. Est. 36 years.
(Inquiries from Employers entail no obligation)
THE NATIONAL BUSINESS BOURSE
20 W. Jackson Blvd., Chicago 4

POSITIONS AVAILABLE
General Manager — small tools $18,000; Master Mechanic — Tools $11,000; Plant Engr. Maint. $10,000; Standards Engr. $8,000; 2 Sales Engrs. Industrials $6-8,000+; Ass't. Sup't. Mchy. $9,000; Safety Engr. $7,000; Chief Engr. small parts $10,000; Engineers & Technical men—all kinds. Employers pay fees most cases.
HARRISON PERSONNEL SERVICE
20 W. Jackson Blvd. Chicago 4

WORLD'S LARGEST INVENTORY
FREE CATALOG
MOTORS-GENERATORS-TRANSFORMERS
New and Guaranteed Rebuilt
1 H.P. to 2500 H.P.
ELECTRIC EQUIPMENT CO.
P. O. BOX 51, ROCHESTER 1, N.Y.

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BOUGHT AND SOLD
We carry a large stock of transformers, and invite your inquiries. New Transformers built to your specifications.

PIONEER TRANSFORMER REBUILDERS
We rewind, repair and redesign all makes and sizes.
One Year Guarantee.

THE ELECTRIC SERVICE CO., INC.
"AMERICA'S USED TRANSFORMER CLEARING HOUSE"
SINCE 1912 CINCINNATI 27, OHIO

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SEARCHLIGHT SECTION
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"That PUNT certainly proves any assembly problem can be licked!"

Mike continued, *"What my company* found out making football shoes can help any manufacturer get better, more economical production. I'd say that includes your refrigerators, Tom."*

"How come?" said Tom.

"I never thought any screw would be just right for holding cleats to my football shoes. That's before the RB&W man came to my plant, and persuaded me to let RB&W try to develop one for me. Now I'm using RB&W screws that are ductile enough to go along with the impact, yet tough enough not to break. It just proves we should all pay closer attention to our fasteners. It really pays off!"

There's a cost-cutting lesson for you in this Rose Bowl conversation, whatever your industry. So look to your fasteners for an often overlooked opportunity to reduce costs, and strengthen your competitive position. New inventions, like RB&W's SPIN-LOCK Screw, may prove more efficient than the fasteners you're now using.** Or you may save by the stepped-up production you get from using the finest fasteners . . . RB&W bolts, screws, nuts and rivets of uniform accuracy, dependability and physical properties.

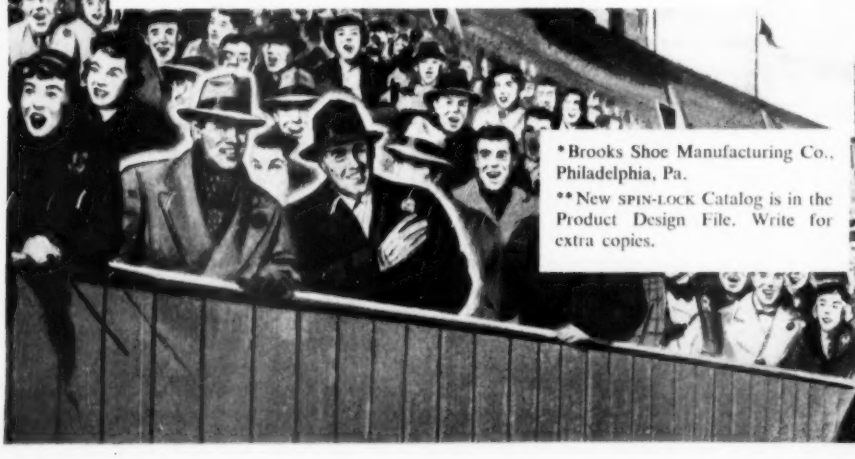
Let RB&W help you make the most efficient use of fasteners on your assembly line. Address RB&W at Port Chester.

RB&W—The Complete Quality Line. Plants at: Port Chester, N. Y., Coraopolis, Pa., Rock Falls, Ill., Los Angeles, Calif. Additional sales offices: Philadelphia, Pittsburgh, Detroit, Chicago, Dallas, San Francisco. Sales agents: Portland, Seattle. Distributors from coast to coast.

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

RB & W

107 YEARS MAKING STRONG THE THINGS THAT MAKE AMERICA STRONG

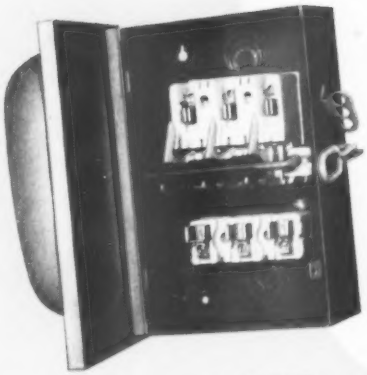


*Brooks Shoe Manufacturing Co., Philadelphia, Pa.

**New SPIN-LOCK Catalog is in the Product Design File. Write for extra copies.

3 LINES OF SAFETY SWITCHES *for* 3 DIFFERENT MARKETS

one line can't do two or three jobs without compromising price and performance!



GENERAL PURPOSE

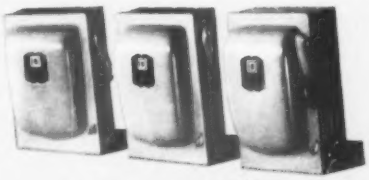
90,000 line designed for residential, commercial and other applications where price is limiting and the service factor is not great.

INDUSTRIAL

40,000 line designed for general industrial or institutional and commercial applications where the service factor is greater and price is an important consideration. MEETS BOTH GOVERNMENT AND NEMA SPECIFICATIONS FOR TYPE A SWITCHES.

HEAVY-DUTY INDUSTRIAL

80,000 and 50,000 line designed for mass production industries where price is secondary to continued performance under conditions of severe service and maximum safety. The 50,000 line is used where space is limited. BOTH ARE TYPE A but go far beyond those requirements.



UNIFORM STYLING

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

"Because we use TIMKEN® bearings on all shafts, we have minimum field trouble"... *says George P. Dorris Co.*

THIS Dorris Speed Reducer, Model 4620, in combination with a chain reduction, carries power from motor to mixer and at the same time reduces the speed from 1750 rpm to 28 rpm, the speed of the mixer shaft. To insure accurate gear mesh and dependable performance, Dorris engineers mount *all* its shafts on Timken® tapered roller bearings.

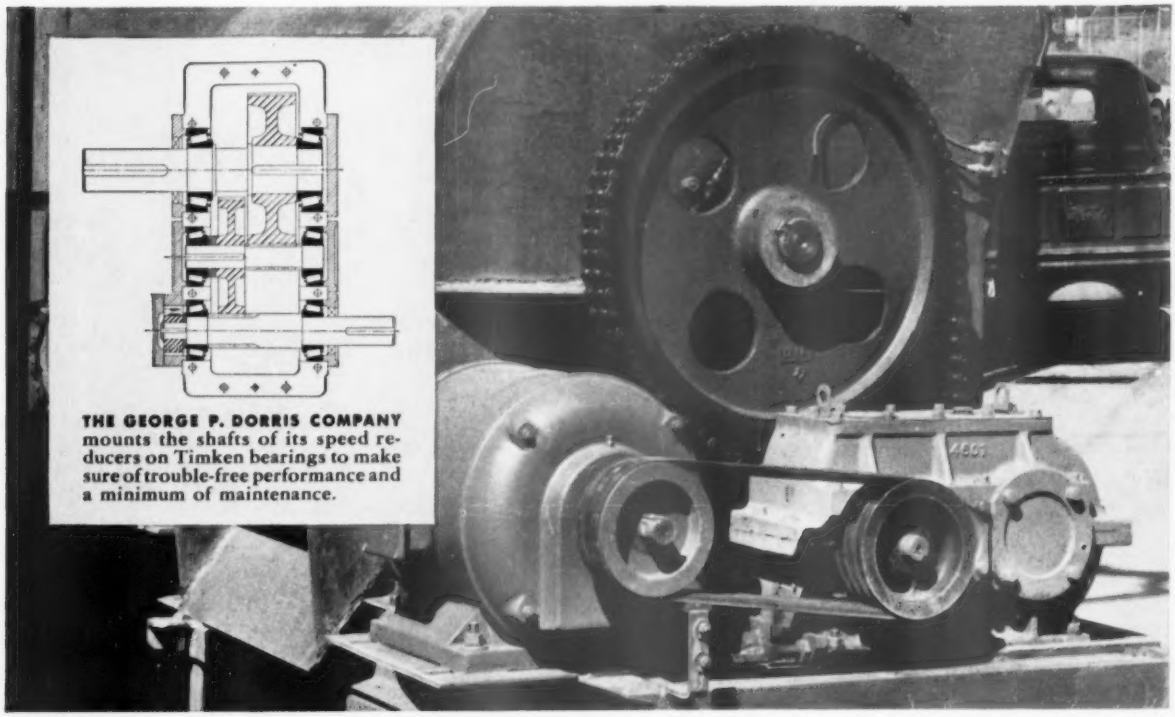
They report: "Timken bearings have always been standard on our speed reducers. They've helped build our reputation for high-quality, long-life equipment. Because we use Timken bearings on all shafts, we have minimum field trouble."

Line contact between the rollers and races of Timken bearings provides greater load carrying capacity. Due to their tapered construction, Timken bearings carry both radial and thrust loads in any combination, increasing the overhung load capacity of the reducer.

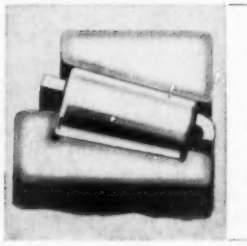
Shafts are held in rigid alignment, reducing gear wear, and increasing machine life.

No other bearings give you all the advantages you get with Timken bearings. Specify them in the machines you build or buy. Look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



THE GEORGE P. DORRIS COMPANY mounts the shafts of its speed reducers on Timken bearings to make sure of trouble-free performance and a minimum of maintenance.



GREATER LOAD AREA

Because the load is carried on the *line* of contact between rollers and races, Timken bearings carry greater loads, hold shafts in line, wear longer.

The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

TIMKEN

TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ⬯ AND THRUST ⟷ LOADS OR ANY COMBINATION